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MEASUREMENT and GEOMETRY

MODULE 6

LEARNING FACILITATOR'S MANUAL

MATHEMATICS 7

Distance Learning

Alberta EDUCATION

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Mathematics 7

Module 6: Measurement and Geometry

LEARNING FACILITATOR'S MANUAL

Note

This Mathematics Learning Facilitator's Manual contains answers to teacher-assessed assignments and the final test; therefore, it should be kept secure by the teacher. Students should not have access to these assignments or the final tests until they are assigned in a supervised situation. The answers should be stored securely by the teacher at all times.

Mathematics 7
Learning Facilitator's Manual
Module 6
Measurement and Geometry
Alberta Distance Learning Centre
ISBN No. 0-7741-0212-8

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Acknowledgements

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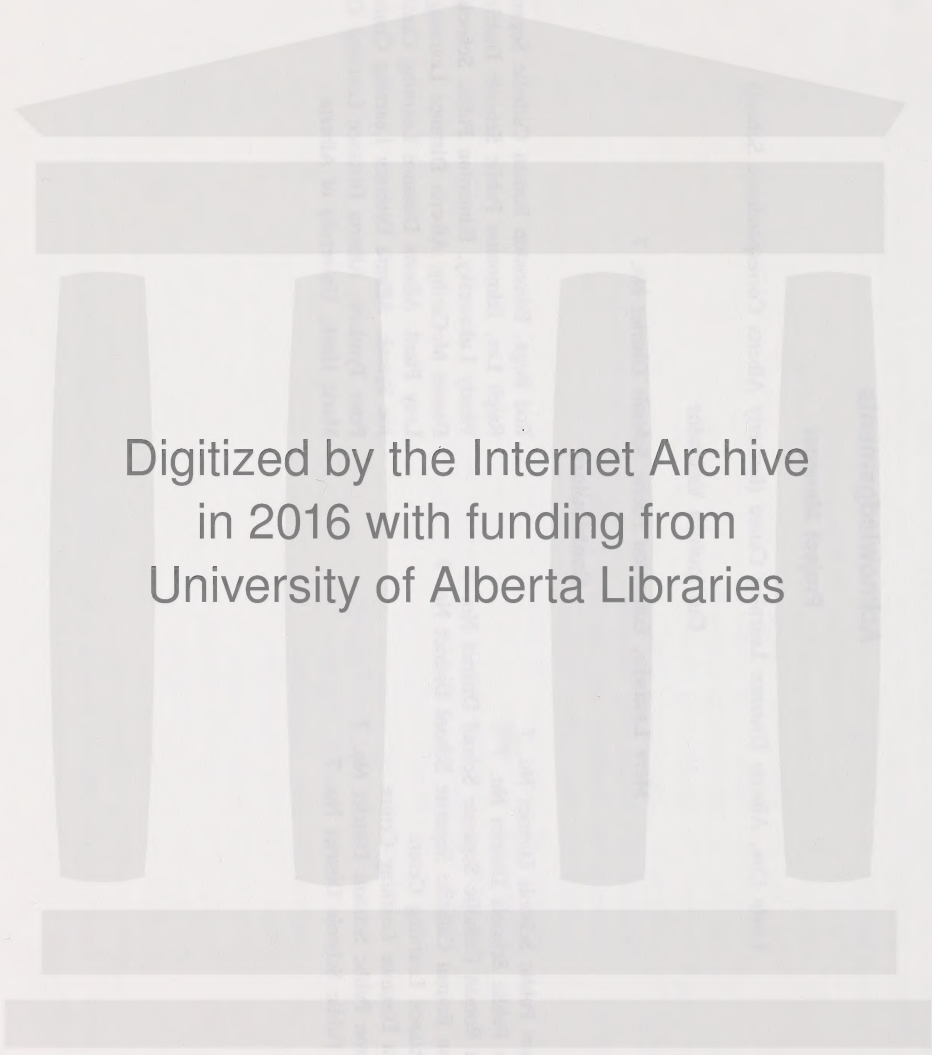
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MODULE INTRODUCTION

What Lies Ahead

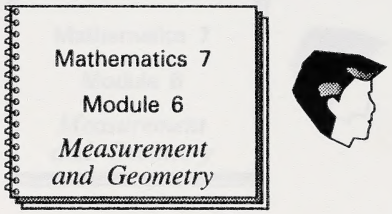
In this module students will be working with measurement and geometry.

Sections 1-13 deal with measurement.

Sections 14-25 deal with geometry.

Gathering Materials

The student will need this item for the introduction.



Put away the *Assignment Booklet* and *LOGO Booklet* until they are needed.

Tell the student where the learning aids, videos, and computer disks are stored.

Guiding the Student

- Have the student preview the *Module Booklet*.
- The have the student read the Module Introduction in the module booklet.
- Afterwards discuss the learning process, time management, and evaluation with the student. See the suggestions on the next page of this booklet.

The Learning Process

Each section of Module 6 deals with a different skill involving measurement and geometry.

Sections have several activities.

- Introductory Activities
- Practice Activities
- Extra Practice
- Concluding Activities

Remind the student that he/she will not be expected to do all the activities. You will help him/her decide what to do.

Time Management

Decide how long the student will need to complete the module. (The average student should spend about 7 weeks or 17.5 hours to complete the module. It is recommended that students spend no more than 1 hour at a time doing mathematics.)

Evaluation

Explain that the grade on Module 6 is based on work in the assignment booklet. The module booklet will help prepare the student for the assignment booklet.

GETTING SET

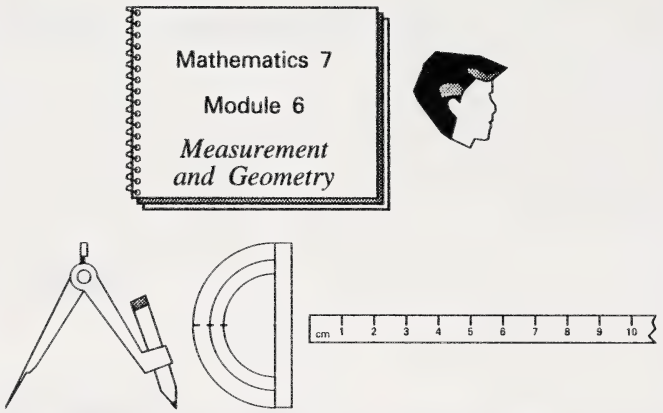
What Lies Ahead

This section tests these skills.

- estimating and measuring the length, mass, capacity, perimeter, area, volume and angles
- comparing areas of objects with the same perimeter
- comparing perimeters of objects with the same area
- relating volume and capacity

Gathering Materials

The student will need these items for this section.



Guiding the Student

- Have the student turn to Section 1 in the module booklet, read the "What Lies Ahead" box, and "Working Together."
- Have the student do the Pretest.
- Afterwards, help the student check the answers. It may not be necessary for the student to correct errors. See the last page of this section for further directions.

Pretest

1. Define measurement.

2. Why do you think the metric system is used by most countries in the world today?

3. Can you ever measure absolutely accurately? Why or why not?

4. What do the following instruments measure?

   a.

   b.

Suggested Answers

1. Measurement is the process of finding out how many measuring units are in something.

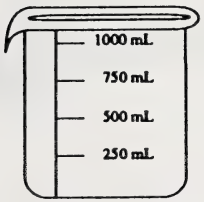
2. The Metric System is based on multiples of 10 so it is simple, coherent, and logical.

3. Every measurement has a degree of uncertainty. The accuracy is influenced by the instruments used and by the individuals using them.

4. a. length

   b. volume or capacity

c.



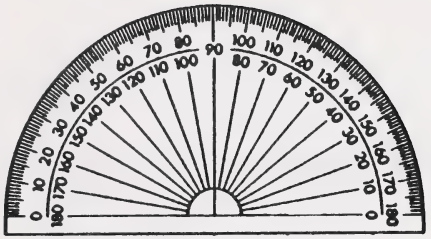
c. capacity or volume

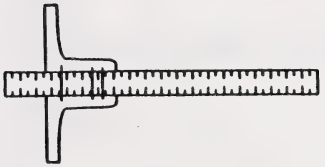
d.

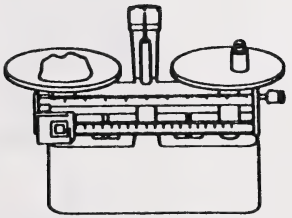
d. breadth of a gap (length across)

e.

e. mass

f. 

g. 

h. 

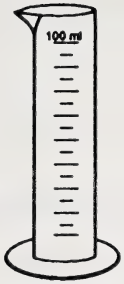
i.

f. angles

g. depth

h. mass

i. length

j. 

k.

j. capacity or volume

k. length

5. What unit would be appropriate to measure each of these?

   a. the distance from Calgary to Banff

   b. the depth of the sea

   c. the length of a fire hose

   d. the width of a book

   e. the thickness of a sheet of paper

   f. your height

5. a. kilometre

   b. metre or kilometre

   c. metre

   d. centimetre

   e. millimetre

   f. millimetres

6. Is each statement reasonable? Answer yes or no.

   a. The pencil is 7 cm long.

   b. The mosquito is 7 m long.

   c. The flagpole is 7 mm long.

   d. The bike trail is 7 km long.

6. a. Yes

   b. No

   c. No

   d. Yes

7. Measure the following line segments.

   a. ———

   b. ———————

   c. ———————————————————————

8. What unit would you use to measure each of these masses?

   a. a stove

   b. a toaster

   c. a box of paper clips

   d. yourself

   e. a hair

7. a. 2.2 cm

   b. 5 cm

   c. 9.8 cm

8. a. kilogram

   b. gram or kilogram

   c. gram

   d. kilogram

   e. milligram or microgram

9. Is each statement reasonable?

   a. A motorcycle has a mass of 0.3 t.

   b. A tennis ball has a mass of 3 kg.

   c. A concrete block has a mass of 11 kg.

   d. A bicycle has a mass of 11 g.

   e. A basketball has a mass of 566 g.

   f. A bag of potato chips has a mass of 450 g.

9. a. Yes

   b. No

   c. Yes

   d. No

   e. Yes

   f. Yes

10. What unit would you use to measure the capacity of each of these?

    a. a tube of toothpaste

    b. a carton of milk

    c. a tanker truck

    d. a thermos

    e. a honey jar

    f. an eye dropper

10. a. millilitre

    b. litre

    c. kilolitre

    d. millilitre or litre

    e. millilitre

    f. millilitre

11. Is each statement reasonable?

    a. A hot water tank has a capacity of 180 mL.

    b. A cereal bowl has a capacity of 225 mL.

    c. A drinking straw has a capacity of 5 mL.

    d. A water balloon has a capacity of 250 mL.

    e. A garbage can has a capacity of 15 L.

    f. A bottle cap has a capacity of 1 L.

11. a. No

    b. Yes

    c. Yes

    d. Yes

    e. Yes

    f. No

12. Give the perimeter of the figures labelled "Section 1 Figures" in the appendix of this booklet. (You may cut out the figures if you wish.)

12. Students are expected to find perimeter by measuring directly. They are not expected to use formulas.

    The perimeter of A is 30 cm.

    The perimeter of B is 30 cm.

    The perimeter of C is 30 cm.

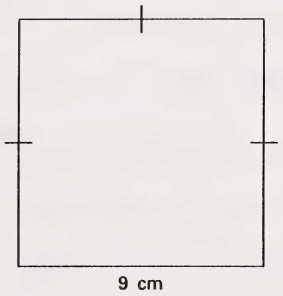
    The perimeter of D is 28.26 cm.

    Note

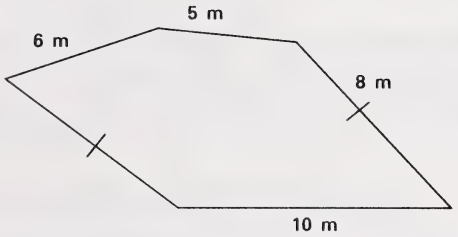
    Students may have difficulty finding the perimeter of D. The student can determine this length by wrapping string around the circumference and measuring the string, or the student can roll the figure along a ruler.

13. Find the perimeter of each sketch.

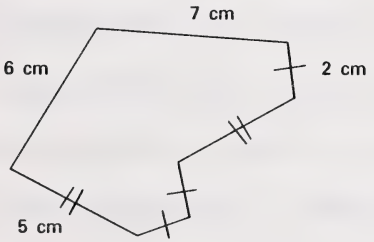
a.



b.



c.



13. Matching marks indicate sides of equal measure.

a. $9 + 9 + 9 + 9 = 36$

The figure has a perimeter of 36 cm.

b. $6 + 5 + 8 + 10 + 8 = 37$

The figure has a perimeter of 37 m.

c. $7 + 2 + 5 + 2 + 2 + 5 + 6 = 29$

The figure has a perimeter of 29 cm.

THE DEVELOPMENT OF MEASUREMENT

What Lies Ahead

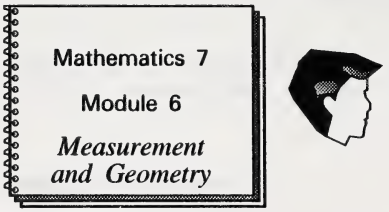
In this section the student will learn about the measurement process and how it was developed.

Note

The student is not expected to memorize the relationships between non-metric units given in this section.

Gathering Materials

The student will need these items for this section.



The student will need access to a library or research books at home for the Concluding Activities.

Guiding the Student

- Have the student turn to Section 2 in the module booklet and read the "What Lies Ahead" box.
- Have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers.

Introductory Activities

1. Pretend you do not have any modern measuring instruments and you do not know a system of measurement. How would you describe the length of the following?

   a. this booklet

   b. a paper clip

2. People sometimes use informal language to describe measurement. What do the following phrases mean?

   a. a stone's throw away

   b. a pinch of salt

   c. seven paces wide

   d. in the wink of an eye

3. List 5 examples in everyday life when more formal measurement is important.

Suggested Answers

1. Answers may vary. Students may suggest units like the width of a thumb.

2. a. a short distance

   b. a very small amount

   c. seven normal steps

   d. a very brief period of time

3. Answers may vary. Students may suggest activities like measuring lumber when building a house.

Guiding the Student

- Have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

1. Use the old Hebrew units of length to do the following. Have your learning facilitator also do these activities.

a.	length of table top in cubits
b.	width of this paper in digits (fingers)
c.	width of this paper in palms
d.	width of the door in spans
e.	length of table top in spans

2. Compare your measurements and those of your learning facilitator.

   a. Are the measurements the same? If not, explain why.

   b. Would you say that using body parts as units of measurement is an accurate way to record measures? Why or why not?

Suggested Answers

1. Answers will vary.

	Your Measurements	Learning Facilitator's Measurements
a.		
b.		
c.		
d.		
e.		

2. a. No, the units of measurement based on the size of body parts vary from person to person. These units are not standardized.

   b. No, measurements would vary considerably. It would be better to use a standard unit of measurement.

3. Why do you think the British redefined the yard in 1855?

4. Explain why the metric system is often said to be easier to use.

3. The British redefined the yard to standardize the unit.

4. The metric system is based on the decimal system. Units are multiples of 10 and so are easy to use.

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

The following activities may require research work in the library or home.

1. What are some of the units of mass in the British or Imperial system?

2. What is the basic unit of mass in the metric system?

3. In the British or Imperial system there are different units for measuring capacity of dry ingredients and liquids. What are they?

4. What is the basic unit of capacity in the metric system?

5. How are the units of capacity, mass, and length in the metric system similar?

Suggested Answers

1. ton, pound, ounce, and grain

2. gram

3. Some of the units for measuring liquid ingredients are gallon, quart, pint, and fluid ounce. Some of the units for measuring dry ingredients are bushel and peck. There are also other units for both such as cup, tablespoon, and teaspoon.

4. litre

5. The units of capacity, mass, and length in the metric system use the same prefixes.

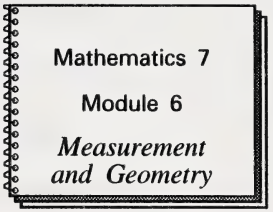
PRECISION AND ESTIMATION IN MEASURING

What Lies Ahead

In this section the student will learn that all measurements are estimates. The precision of the measurement depends on the tool used and how well the person can use it.

Gathering Materials

The student will need these items for this section.



(Optional)

SOLVE IT: Precision and Estimation

(Optional)

Mathematics for Science, Measurement Disk, "Scales"

Guiding the Student

- Have the student turn to Section 3 in the module booklet and read the "What Lies Ahead" box.
- Have the student read "Working Together" and watch the video. If the student can't view the video, have him or her read the program summary.
- Next have the student do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Suggested Answers to Practice Activities

1. In the video (or video summary) you learned that the two girls paced out a distance of 100 m and then used a stopwatch to time how fast they ran that distance. What are some reasons their times might not be accurate?

1. The accuracy of the time depends upon the accuracy of the distance they paced off and the precision with which they used the stop watch.

2. What characteristics of a measuring instrument determines how precisely it measures?

2. The more precise the measuring instrument the more precise is its measurements.

3. What instrument would you use to measure in each of the following situations?

   a. distance on a bike hike

   b. thickness of a piece of paper

   c. how fast a race is run

   d. length of a football field

   e. height of a basketball player

3. a. odometer

   b. micrometer

   c. stop watch

   d. a trundle wheel

   e. measuring tape

4. Can you ever measure absolutely accurately? Why or why not?

4. No. The precision of the measurement depends on the tool you use and how well you use it.

Computer Alternative

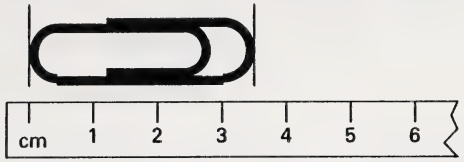
5. Do "Scales" on the *Mathematics for Science: Measurement* disk.

5. Computer checked.

Print Alternative

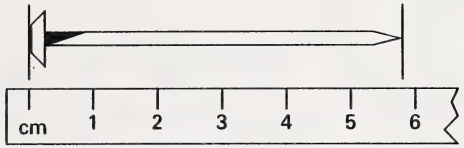
6. Give the length of each object in centimetres.

a.



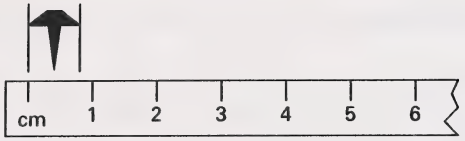
6. a. 3.5 cm

b.



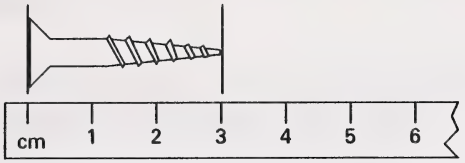
b. 6 cm

c.



c. 1 cm

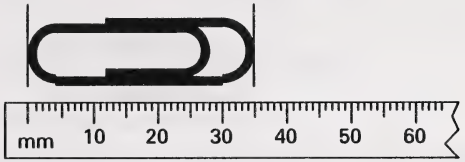
d.



d. 3 cm

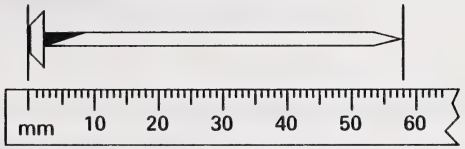
7. Give the length of each object in millimetres.

a.



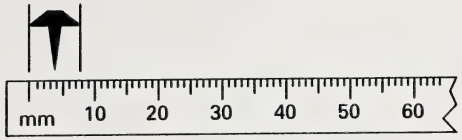
7. a. 35 mm

b.

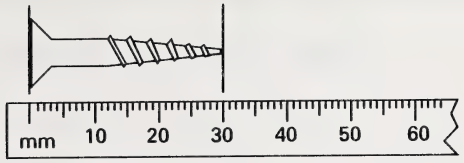


b. 58 mm

c.



d.



c. 8 mm

d. 30 mm

MEASURING LENGTH

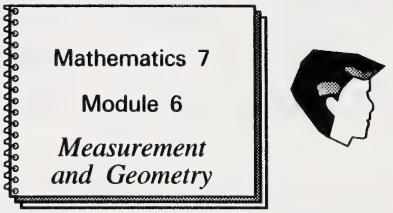
What Lies Ahead

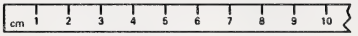
In this section the student will learn these skills.

- estimating the length of objects
- measuring the length of objects

Gathering Materials

These items will be needed for this section.





Guiding the Student

- Have the student turn to Section 4 in the module booklet and read the "What Lies Ahead" box.
- Have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

1. What unit would be appropriate to measure the following?

   a. the distance from Edmonton to Calgary

   b. the height of a mountain

   c. the length of a stamp

   d. the thickness of a dime

   e. the thickness of a 250-page book

   f. the length of a car

   g. your height

   h. the length of your house

   i. the depth of a river

   j. the thickness of the lead in your pencil

Suggested Answers

1. a. kilometre

   b. metre

   c. centimetre

   d. millimetre

   e. centimetre

   f. metre

   g. centimetre

   h. metre

   i. metre

   j. millimetre

2. Circle the most reasonable measure.

a. height of a basketball hoop

b. height of a bike

c. height of football posts

d. height of a bowling pin

e. length of a bowling alley

f. length of a hockey stick

g. length of a baseball bat

h. length of a canoe

2. a. 300 mm (300 cm) 300 m 300 km

b. 99 mm (99 cm) 99 m 99 km

c. 6 mm 6 cm (6 m) 6 km

d. 38 mm (38 cm) 38 m 38 km

e. 18 mm 18 cm (18 m) 18 km

f. 138 mm (138 cm) 138 m 138 km

g. 1 mm 1 cm (1 m) 1 km

h. 4 mm 4 cm (4 m) 4 km

i. width of a paper clip	i.	(8 mm)	8 cm	8 m	8 km
j. width of a bookcase	j.	40 mm	(40 cm)	40 m	40 km
k. width of a chair	k.	53 mm	(53 cm)	53 m	53 km
l. width of a house	l.	10 mm	10 cm	(10 m)	10 km
m. distance from Vancouver to Victoria	m.	100 mm	100 cm	100 m	(100 km)
n. diameter of a pea	n.	(5 mm)	5 cm	5 m	5 km

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, discuss the activities with the student.

Concluding Activities

1. Estimate the following.

   a. the length of your foot

   b. the width of your fingernail

   c. the circumference of your waist

   d. the length of a pair of scissors

   e. the width of a paper clip

   f. the length of a pencil

   g. the width of the lead in your pencil

   h. the height of your room

   i. the height of a door

2. a. Use a metre stick, ruler, or tape measure to find the measures of the items in Question 1.

   b. How close were your estimates?

Suggested Answers

1. Answers may vary.

2. Answers may vary.

MEASURING MASS

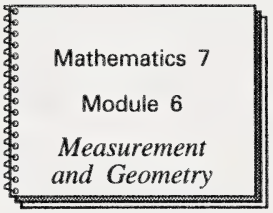
What Lies Ahead

In this section the student will learn these skills.

- estimating the mass of an object
- measuring the mass of an object

Gathering Materials

This item will be needed.



In the Concluding Activities the student will need to visit a supermarket or a school laboratory. If neither of these options is possible you will need to assemble several objects that have labels with the mass of the object on it (examples: a bag of flour, a roast of beef, a package of cereal, a glue stick, etc.).

Guiding the Student

- Have the student turn to Section 5 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

1. Which unit would you use to describe each of the following masses?

   a. a whale

   b. a cat

   c. a person

   d. a tropical fish

   e. a pencil

   f. riboflavin (vitamin B_2) in cereal

   g. a television

   h. a plane

Suggested Answers

1. a. tonne

   b. kilogram

   c. kilogram

   d. gram

   e. gram

   f. milligram

   g. kilogram

   h. tonne

2. Circle the most reasonable measure.

a. a carrot

b. a cat

c. an elephant

d. a person

e. a penny

f. a stamp

g. a railway car

h. a blueberry

i. a headache tablet

2. a. 50 mg **(50 g)** 50 kg 50 t

b. 3 mg 3 g **(3 kg)** 3 t

c. 5 mg 5 g 5 kg **(5 t)**

d. 50 mg 50 g **(50 kg)** 50 t

e. 2 mg **(2 g)** 2 kg 2 t

f. **(20 mg)** 20 g 20 kg 20 t

g. 60 mg 60 g 60 kg **(60 t)**

h. **(500 mg)** 500 g 500 kg 500 t

i. **(350 mg)** 350 g 350 kg 350 t

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, discuss the activities with the student.

Concluding Activities

Do **one** from Questions 1 to 3.

1. a. Visit a supermarket and estimate the mass of several items of produce (such as the ones in the following list). Then use the scales to check your estimates.

   - a lemon
   - a green pepper
   - a package of carrots
   - a bag of potatoes
   - a pea pod
   - an apple
   - an avocado
   - a strawberry
   - a head of lettuce
   - a bunch of bananas

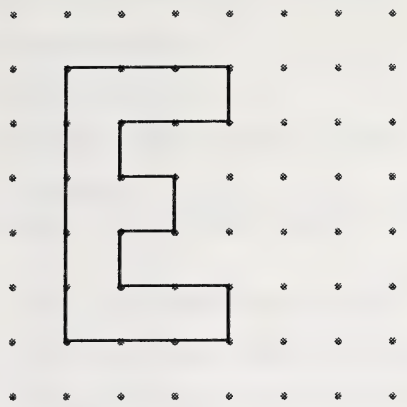
   b. Fill a bag with produce until you think the bag weighs 1 kg. Check the mass on the scales.

Suggested Answers

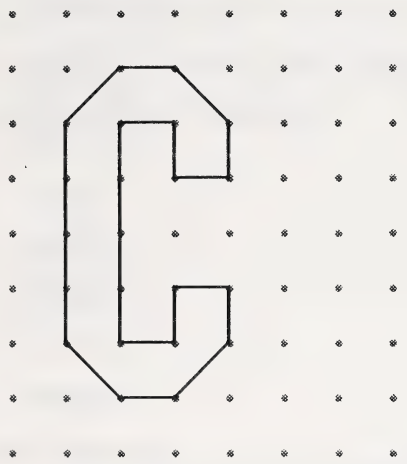
1. Answers may vary.

14. Give the area of each figure.

a.



b.



14. a. The figure has an area of 10 square units.

b. The figure has an area of 12 square units.

15. Which unit would you use to measure the area of each of the following?

    a. a garden

    b. a place mat

    c. a farm

    d. a province

    e. a stamp

16. Is each statement reasonable?

    a. The area of a hockey rink is 1586 km^2.

    b. The area of a credit card is 46.75 cm^2.

    c. The area of a felt pennant is 0.3 m^2.

    d. The area of a stop sign is 4320 cm^2.

    e. The area of a ball park is 5.1 ha.

17. Are you concerned with perimeter or area when you do the following?

    a. paint the walls of your livingroom

    b. fertilize your lawn

    c. fence your yard

    d. frame a picture

15. a. square metre

    b. square centimetre

    c. square hectometre or hectare

    d. square kilometre

    e. square centimetre or square millimetre

16. a. No

    b. Yes

    c. Yes

    d. Yes

    e. Yes

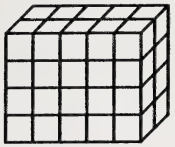
17. a. area

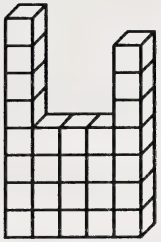
    b. area

    c. perimeter

    d. perimeter

18. Find the volume of the following. (You may use base 10 blocks to construct the figure first.)

a. 

b. 

c.

d.

18. a. The shape has a volume of 40 cubic units.

b. The shape has a volume of 27 cubic units.

c. The shape has a volume of 18 cubic units.

d. The shape has a volume of 10 cubic units.

19. What unit would you use to measure the volume of each of these?

    b. a moving truck

    c. a box of cereal

    d. a swimming pool

    b. m^3

    c. cm^3

    d. m^3

20. Is each statement reasonable?

    a. The volume of a walnut is 12 m^3.

    b. The volume of a washroom is 0.1 m^3.

    c. The volume of a softball is 480 cm^3.

    d. The volume of a loaf of bread is 3500 m^3.

20. a. No

    b. Yes

    c. Yes

    d. Yes

21. Complete the following.

a. 30 cm = ☐ mm

b. 152 mm = ☐ m

c. 3 L = ☐ mL

d. 518 g = ☐ kg

21. a. 300 mm

b. 0.152 m

c. 3000 mL

d. 0.518 kg

22. Complete the following.

a. 13 mL = ☐ cm^3

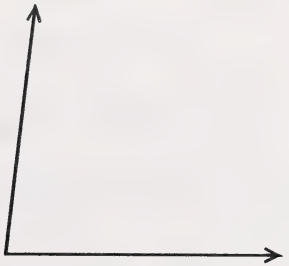
b. 2 L = ☐ cm^3

22. a. 13 cm^3

b. 2000 cm^3

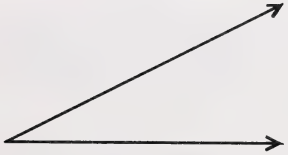
23. Measure the following angles.

a.



b.

c.



d.

23. a. 85°

b. 130°

c. 27°

d. 180°

Guiding the Student

After checking the answers, compare the student's results with the following chart. (The chart lists the skills covered in the Pretest and the section in which each skill will be taught.)

Question	Skill	Section
1, 2	Knowledge of development of measurement	2
3, 4	Precision and estimation in measurement	3
5, 6, 7	Measuring length	4
8, 9	Measuring mass	5
10, 11	Measuring capacity	6
12, 13, 17	Measuring perimeter	7
14, 15, 16, 17	Measuring area	8
18, 19, 20	Measuring volume	9
21	Equivalent measures	12
22	Relating volume and capacity	10
23	Measuring angles	11

Help the student to decide what to do next. It is recommended that the student does most of the sections which correspond to the questions with which the student experienced difficulties and only the concluding activities in sections which correspond to the questions with which the student experienced success.

2. a. Visit a school laboratory and estimate the masses of several items (such as the ones in the following list). Then use the scales to check your estimates.

   - a paper clip
   - a matchbook
   - a textbook
   - a pair of scissors
   - a stapler
   - a shoe
   - a sheet of paper
   - a protractor
   - a glue stick
   - a rubber band

   b. Fill a bag with objects until you think the bag weighs one kilogram. Check the mass on the scales.

2. Answers may vary.

3. Have your learning facilitator assemble several items that have labels with the mass of the object on it (example: a bag of flour, a roast of beef, a package of cereal, a glue stick). Estimate the mass of each item. Then check the labels.

3. Answers may vary.

MEASURING CAPACITY

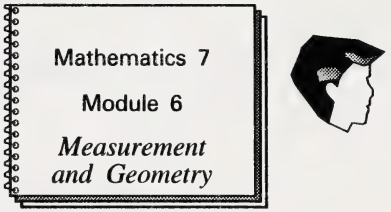
What Lies Ahead

In this section the student will learn these skills.

- estimating the capacity of an object
- measuring the capacity of an object

Gathering Materials

This item will be needed.



In the Concluding Activities the student will need metric measuring cups and spoons. If these are not available you will need to assemble several objects that have labels with the capacity of the object on it (examples: a can of soup, a can of juice, a tube of toothpaste, a can of paint).

Guiding the Student

- Have the student turn to Section 6 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

1. Which unit would you use to describe the capacity of the following?

   a. an eye dropper

   b. a jelly jar

   c. a soup spoon

   d. a dessert bowl

   e. a drinking glass

   f. a bath tub

   g. a swimming pool

   h. a mixing bowl

   i. a picnic jug

   j. a washing machine

Suggested Answers

1. a. millilitre

   b. millilitre

   c. millilitre

   d. millilitre

   e. millilitre

   f. litre

   g. litre or kilolitre

   h. millilitre or litre

   i. millilitre or litre

   j. litre or kilolitre

2. Circle the most reasonable measure.

a. a can of paint

b. a shampoo bottle

c. a bottle of liquid paper

d. a carton of milk

e. a water barrel

2. a. 5 mL (5 L)

b. (750 mL) 750 L

c. (18 mL) 18 L

d. 2 mL (2 L)

e. 15 mL (15 L)

3. Arrange the following units from smallest to largest.

250 mL, 1200 mL, 1 L, 25 L, 0.3 KL

3. 250 mL, 1 L, 1200 mL, 25 L, 0.3kL

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, discuss the activities with the student.

Concluding Activities

Do **one** from Questions 1 and 2.

1. Borrow metric measuring cups and spoons from the home economics class or your kitchen. Fill empty containers such as the following with water and estimate the capacity of each. Then measure the amount of water each holds.

   a. a bottle cap

   b. a drinking glass

   c. a cereal bowl

   d. a mixing bowl

   e. a can

   f. a pop bottle

   g. a jar

Suggested Answers

1. Answers may vary.

2. Have your learning facilitator assemble several items that have labels with the capacity on them (for example: a can of soup, a can of juice, a bottle of jelly, a tube of toothpaste, a can of paint).

   Estimate the capacity of each item. Then check the labels.

2. Answers may vary.

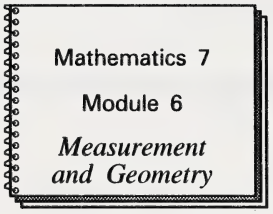
MEASURING PERIMETER

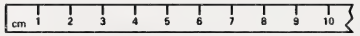
What Lies Ahead

In this section the student will learn to find the perimeter of a figure.

Gathering Materials

These items will be needed.





strips of paper, string

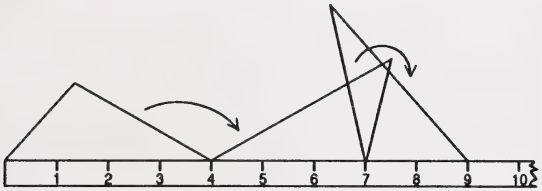
Guiding the Student

- Have the student turn to Section 7 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers and correct any errors.

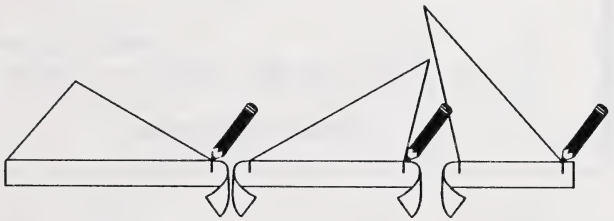
Introductory Activities

1. Cut out the figures labelled "Section 7 Figures" in the appendix. Then do one or more of the following to find the perimeter of each figure. Record the perimeter of each figure on the figure.

   a. Find the perimeter of the figures by "rolling" the figure along a metric ruler or metre stick.



   b. Use a strip of paper to help you find the perimeter of each figure.



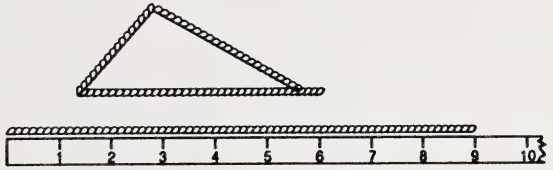
Suggested Answers

1. a. Answers may vary slightly from the following because this is an inaccurate way to measure perimeter.

   The perimeter of A is 25.4 cm.
   The perimeter of B is 26 cm.
   The perimeter of C is 27 cm.
   The perimeter of D is 28 cm.
   The perimeter of E is 25 cm.
   The perimeter of F is 20.7 cm.

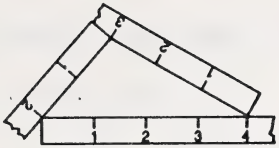
   b. Answers should be about the same as in Part a.

c. Use string to help you find the perimeter of each figure. Then measure the string.



c. Answers should be about the same as in Part a.

d. Measure each side of a figure and find the sum.



d. Answers should be about the same as in Part a.

2. Find the perimeter of the following.

   a. your booklet

   b. your desk

   c. your room

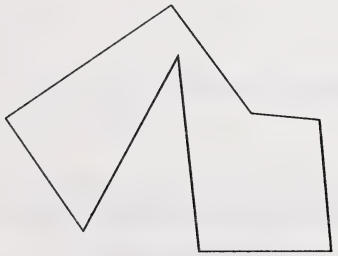
   d. your waist

   e. your ring finger

   f. the sole of your shoe

3. Measure the length of the sides of each figure and find the perimeter.

   a.

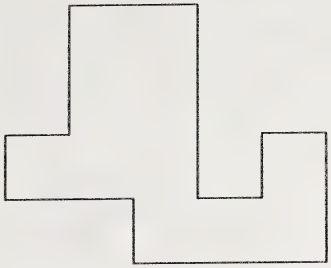


2. Answers may vary.

3. a. 3 + 2 + 1 + 2 + 2 + 3 + 3 + 2 = 18

   The figure has a perimeter of 18 cm.

b.



b. 2 + 3 + 1 + 1 + 1 + 2 + 3 + 1 + 2 + 1 + 1 + 2 = 20

The figure has a perimeter of 20 cm.

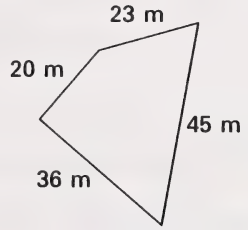
Guiding the Student

- Have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

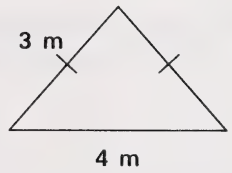
Practice Activities

1. Give the perimeters of the sketches. (A sketch is not drawn to scale.)

a.

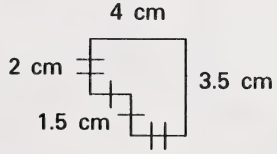


b.



Matching marks indicate the same measure.

c.



Suggested Answers

1. a. $23 + 36 + 45 + 20 = 124$

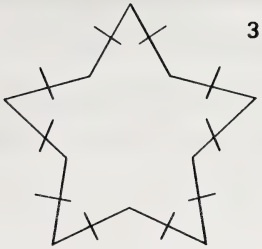
The perimeter is 124 m.

b. $3 + 3 + 4 = 10$

The perimeter of the triangle is 10 m.

c. $4 + 3.5 + 2 + 1.5 + 1.5 + 2 = 14.5$

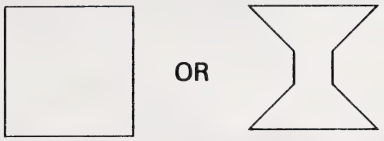
The perimeter is 14.5 cm.

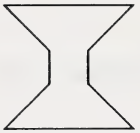
d. 

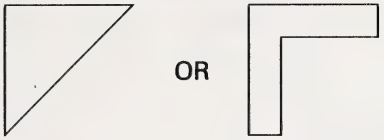
d. $3 \times 10 = 30$

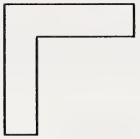
The perimeter of the star is 30 cm.

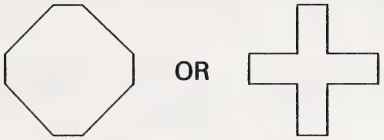
2. Which has the greater perimeter?

a.  OR

2. a. 

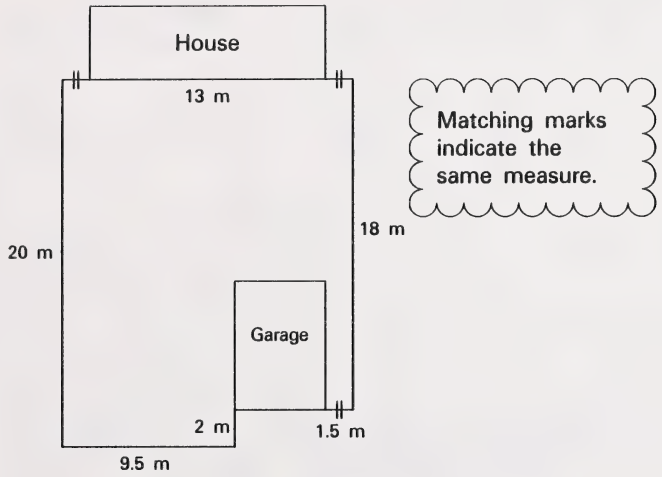
b.  OR

b. 

c.  OR

c.

3. Al Yarmalay wants to fence his back yard.



What is the perimeter of the region to be fenced?

3. $1.5 + 18 + 1.5 + 2 + 9.5 + 20 + 1.5 = 54$

The perimeter of the region to be fenced is 54 m.

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, discuss the activities with the student.

Concluding Activities

1. Cut out 9 1-cm squares from the 1-cm grid paper in the appendix the booklet. Arrange them in a 3-cm by 3-cm array.

   a. What is the perimeter?

   b. Show how you can remove 4 squares without affecting the perimeter.

2. Use 4 of the squares to form a figure with a perimeter of

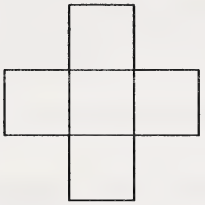
   a. 8 cm

Suggested Answers

1. a. $3 + 3 + 3 + 3 = 12$

   The perimeter is 12 cm.

   b.



2. a.

b. 10 cm

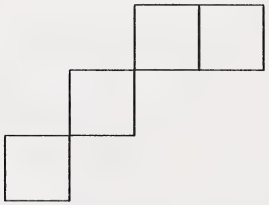
c. 12 cm

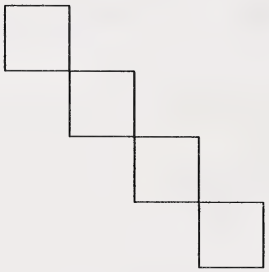
d. 14 cm

e. 16 cm

b.

c.

d. 

e. 

MEASURING AREA

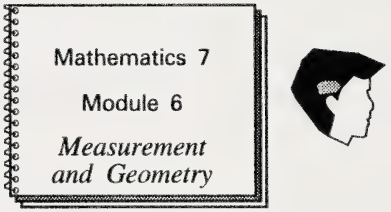
What Lies Ahead

In this section the student will learn these skills.

- measuring the area of figures using grid paper
- estimating the area of figures

Gathering Materials

This item will be needed.



In the Concluding Activities the student will need several small objects from around the house or classroom.

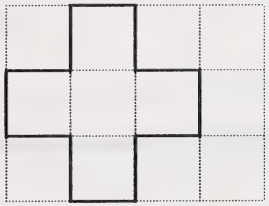
The student will also need sheets of newspaper.

Guiding the Student

- Have the student turn to Section 8 in the module booklet and read the "What Lies Ahead" box.
- Then have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers and correct any errors.

Introductory Activities

1. Find the area of the following shapes by counting the square units.

a. 

b.

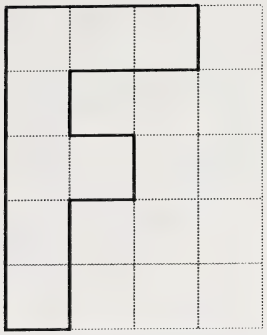
c.

Suggested Answers

1. a. 5 square units

b. 6 square units

c. 7 square units

d. 

2. Find the areas of the following figures by counting the square units. Part a is done as an example.

a.

d. 8 square units

2. a.

$$1 + 1 + 1 + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 4\frac{1}{2}$$

There are **3** whole squares (x) and **3** half squares (✓). So the area is $4\frac{1}{2}$ square units.

b.

b. 10 square units

c.

c. 12 square units

d.

d. 12 square units

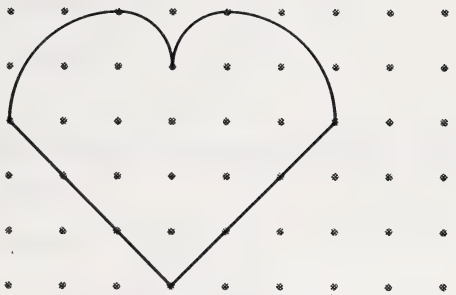
e.

e. 9 square units

f.

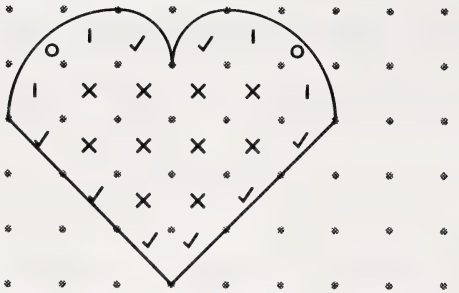
3. Find the area of the following figures by counting the square units. a is done as an example.

a.



f. 12 square units

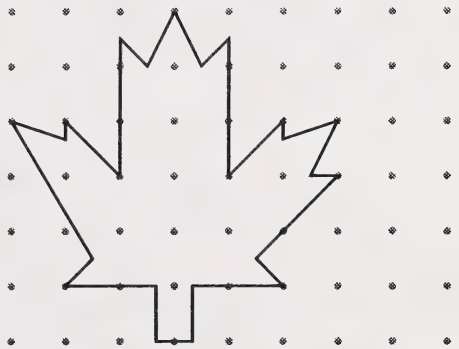
3. a.



There are **10** whole squares (×).	10
There are **8** half squares (✓).	4
There are **2** regions that are closer to zero square units (O).	0
There are **4** regions that are closer to one square unit (I).	4
	18

So the area is about 18 square units.

b.



b. There are 10 whole squares.
There are 4 half squares.
There are 7 other parts of squares.

The area is about 15 or 16 square units.

Guiding the Student

- Have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

1. Which unit would you use for the area of each of the following?

   a. a desk top

   b. this page

   c. the livingroom floor

   d. a provincial park

   e. a parking lot

   f. a stamp

2. Circle the most reasonable measure for the area of the following.

   a. Toronto

   b. the field inside an Olympic track

   c. a card table cover

Suggested Answers

1. a. square centimetre

   b. square centimetre

   c. square metre

   d. square kilometre

   e. square metre, square hectometre, or hectare

   f. square millimetre or square centimetre

2. a. 620 cm^2 620 m^2 620 ha (620 km^2)

   b. 1 cm^2 1 m^2 (1 ha) 1 km^2

   c. 0.6 cm^2 (0.6 m^2) 0.6 ha 0.6 km^2

d. a computer disk

e. a wallet photograph

f. the top of a videocassette

d. (169 cm^2) 169 m^2 169 ha 169 km^2

e. (40 cm^2) 40 m^2 40 ha 40 km^2

f. (230 cm^2) 230 m^2 230 ha 230 km^2

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

1. Collect several small objects from your house or classroom.

   First estimate the area each object will cover.

   Then use the 1-cm grid paper in the appendix of this booklet to check your estimates. (Lay the objects on the grid paper and trace them. Then count the squares.)

2. Two full **sheets** of *The Edmonton Journal* and *Calgary Herald* cover approximately 1 m^2.

   Use sheets of newspaper to cover the following areas.

   a. 1 m^2

   b. 2 m^2

   c. 3 m^2

3. Estimate the area of the livingroom floor in your house (or the classroom floor in your school).

Suggested Answers

1. Answers will vary.

2. Answers will vary.

3. Answers will vary.

MEASURING VOLUME

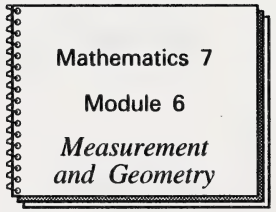
What Lies Ahead

In this section the student will learn these skills.

- interpreting volume
- finding the volume of a rectangular solid by counting cubes
- estimating volumes of rectangular solids

Gathering Materials

This item will be needed.



Base 10 Blocks

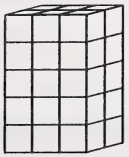
In the Concluding Activities the student will need several small boxes from around the house or school.

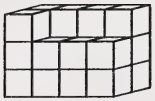
Guiding the Student

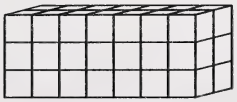
- Have the student turn to Section 9 in the module booklet and read the "What Lies Ahead" box.
- Have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers and correct any errors.

Introductory Activities

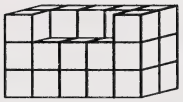
1. Construct the following with units from the base 10 blocks. Then count the units to find the volume.

a. 

b. 

c. 

d.

e. 

Suggested Answers

1. a. 30 cubic units

b. 21 cubic units

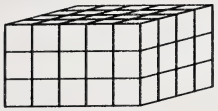
c. 42 cubic units

d. 17 cubic units

e. 27 cubic units

f.

f. 16 cubic units

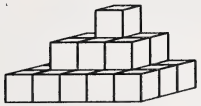
g. 

g. 60 cubic units

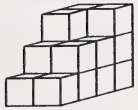
2. Find the volumes by counting cubes in the diagrams. Remember the hidden cubes.

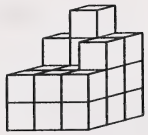
a.

2. a. 10 cubic units

b. 

b. 22 cubic units

c. 

d. 

c. 17 cubic units

d. 23 cubic units

Guiding the Student

- Have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

1. What unit would you use for the volume of each of the following?

   a. a camper

   b. a walnut

   c. a freezer

   d. a suitcase

2. Circle the most reasonable measure.

   a. the volume of a tool chest

   b. the volume of an aquarium

   c. the volume of a livingroom

Suggested Answers

1. a. cubic metre

   b. cubic centimetre

   c. cubic metre

   d. cubic centimetre

2. a. 57.6 cm^3 576 cm^3 (5760 cm^3)

   b. 72 cm^3 720 cm^3 (7200 cm^3)

   c. 50 m^3 (500 m^3) 5000 m^3

d. the volume of a four-drawer filing cabinet

d. (0.4 m^3) 4 m^3 40 m^3

e. the volume of a softball

e. 48 cm^3 (480 cm^3) 4800 cm^3

3. Arrange from smallest to largest.

0.6 m^3, 800 cm^3, 1200 cm^3, 9 m^3

3. 800 cm^3, 1200 cm^3, 0.6 m^3, 9 m^3

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, discuss the activities with the student.

Concluding Activities

Gather several small boxes from around the house (or school).

Estimate the volume of each box.

Check your estimates by doing **one** of the following.

- Arrange the units (smallest pieces of base 10 blocks) in the box. Count the number of units. Each unit is 1 cm^3.

OR

- Tape 1-cm grid paper to the outside faces of the box. Determine the number of cm^3 the box will hold. There is 1-cm grid paper in the appendix of this booklet.

Suggested Answers

Answers will vary.

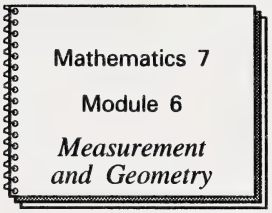
RELATING VOLUME AND CAPACITY

What Lies Ahead

In this section the student will learn how volume and capacity are related in the metric system.

Gathering Materials

These items will be needed.



SOLVE IT: Measuring Volume

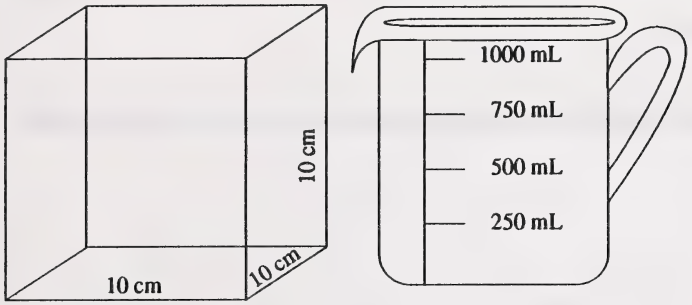
For the investigations the student will need a 1-dm^3 box, rice (or any other dry ingredient), a pan, a container, a ball of modelling clay (or any other small solid object), water, a metric measuring cup, and a graduated cylinder (optional).

Guiding the Student

- Have the student turn to Section 10 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers and correct any errors.

Introductory Activities

For this investigation you will need a 1-dm^3 cube, a 1-L measuring cup, and some rice or other dry ingredients.



If you do not have a 1-dm^3 cube you can make one by taping together 5 pieces of cardboard that are each 1 dm^2 (10 cm by 10 cm).

If you do not have a 1-L measuring cup, use an empty 1-L milk carton.

Suggested Answers

1. Fill the measuring cup with 1 L of rice (or some other dry ingredient).

2. Empty the measuring cup into the 1-dm^3 cube.

3. How do the capacities of the measuring cup and the box compare?

3. 1 dm^3 = 1 L

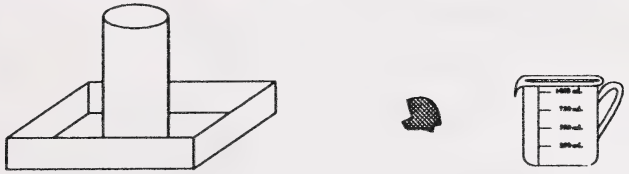
Guiding the Student

- Have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

1. For this investigation you will need a pan, a container, a ball of modelling clay (or any other small solid object), water, and a metric measuring cup.

   a. Fill the container to the very top with water. Without spilling any water, place the container in the pan.



   b. Add the ball of modelling clay to the container.

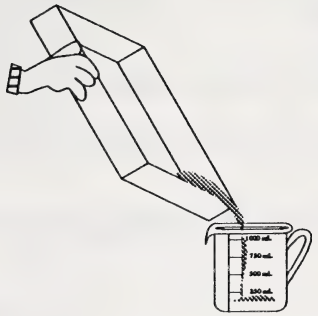
   Note: Some water will overflow into the pan.

Suggested Answers

1. Answers may vary, but the solid object will have the same volume as the water that is displaced.

c. Carefully remove the container from the pan. Do not spill any water.

d. Pour the overflow water from the pan into the measuring cup.

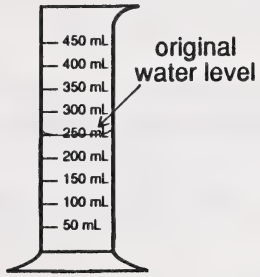


e. Measure the amount of water in the measuring cup.

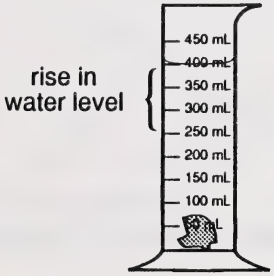
f. Calculate the volume of the modelling clay. (If the clay displaces 100 mL, the volume of the clay is 100 cm^3.)

2. If you have access to a graduated cylinder and some modelling clay, you may wish to try an investigation similar to the following.

   a. Fill a graduated container with water to the 250-mL mark.



   b. Carefully immerse the piece of modelling clay.



2. Answers may vary.

c. Calculate the rise in the water level.

The water level rises from the 250-mL mark to the 400-mL mark.

new water level	400 mL
− original water level	− 250 mL
rise in water level	150 mL

The modelling clay displaces 150 mL of water.

The modelling clay occupies 150 cm^3 of space in the container.

The volume of the modelling clay is 150 cm^3.

3. Obtain some small solid objects from around the house or school. Use the methods in Question 1 or 2 to find the volume of the objects.

3. Answers may vary.

Guiding the Student

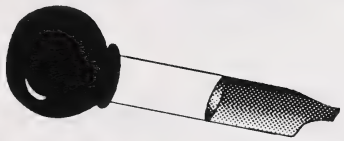
- Assign the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

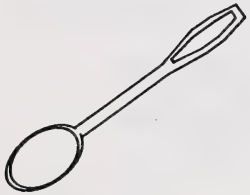
Write the volume of the following.

1.

350 mL = _____ cm^3

2. 

20 mL = _____ cm^3

3. 

15 mL = _____ cm^3

Suggested Answers

1. 350 mL = 350 cm^3

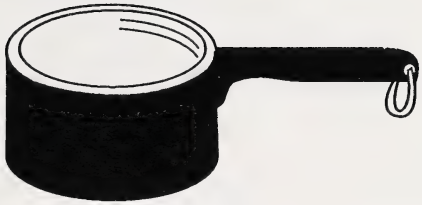
2. 20 mL = 20 cm^3

3. 15 mL = 15 cm^3

4.

3 L = _____ cm^3

5.



2 L = _____ cm^3

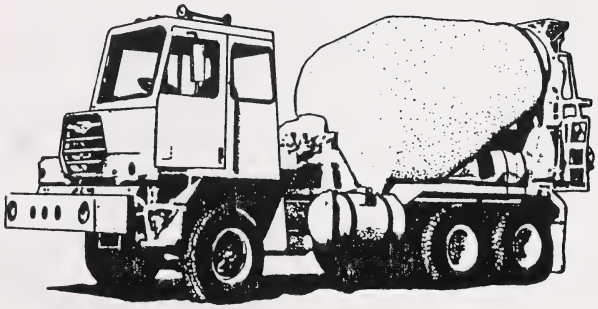
4. 1 L = 1000 cm^3

3 L = 3000 cm^3

5. 1 L = 1000 cm^3

2 L = 2000 cm^3

6.



6 kL = _____ m^3

6. 6 kL = 6 m^3

MEASURING ANGLES

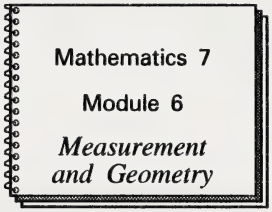
What Lies Ahead

In this section the student will learn these skills.

- measuring angles
- estimating angles
- naming angle

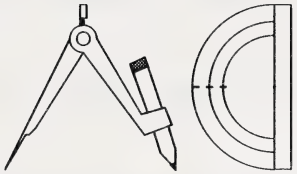
Gathering Materials

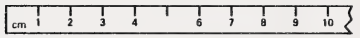
The student will need these items for this section.



(Optional)

Disk B of MAC "Learning all the Angles"





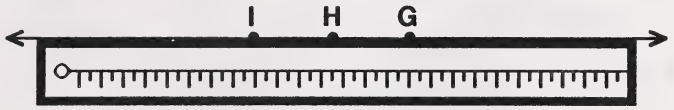
Guiding the Student

- Have the student turn to Section 11 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers and correct any errors.

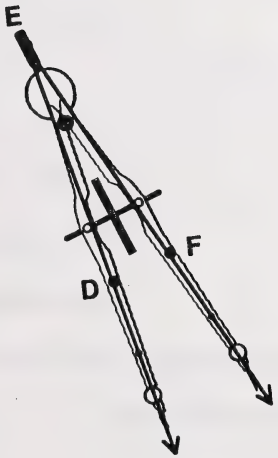
Introductory Activities

1. Name the following angles three ways.

a.



b.

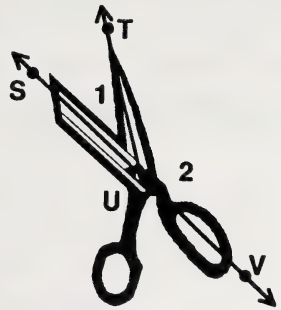


Suggested Answers

1. a. ∠IHG, ∠GHI, or ∠H

b. ∠DEF, ∠FED, or ∠E

2. a. Name $\angle 1$ using letters.



b. Name $\angle 2$ using letters.

2. a. $\angle SUT$ or $\angle TUS$

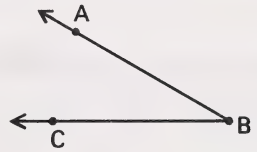
b. $\angle TUV$ or $\angle VUT$

Guiding the Student

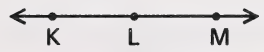
- Have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

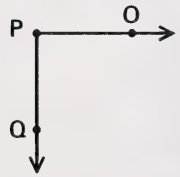
Practice Activities

1. Estimate the measure of the following angles.

a. 

b.

c. 

d. 

2. Measure the angles in Question 1.

Suggested Answers

1. Answers may vary.

2. a. 30° b. 125° c. 180° d. 90°

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

1. Sketch these angles. Use a straightedge but do not use a protractor.

   a. 90°

   b. 180°

   c. 45°

   d. 135°

Suggested Answers

1. Answers may vary.

e. 20°

f. 165°

g. 75°

h. 150°

2. Measure the angles you sketched in Question 1.

2. Answers may vary.

3. Draw the following angles with a protractor. Then compare your sketches in Question 1 and these drawings using a protractor.

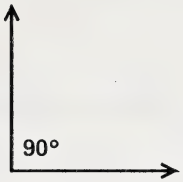
   a. 90°

   b. 180°

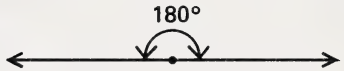
   c. 45°

   d. 135°

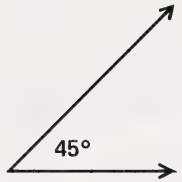
3. a.



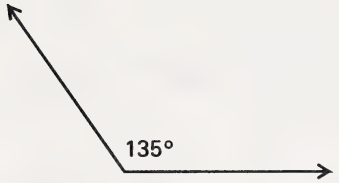
b.



c.



d.



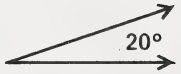
e. 20°

f. 165°

g. 75°

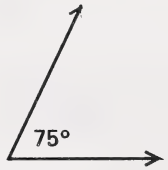
h. 150°

e.

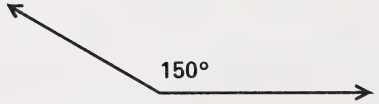


f.

g.



h.



Computer Activity

4. Do "Learning all the Angles" on Disk B of MAC 6.

4. Computer checked.

5. Play "Geo Pool and Geo Billiards." It is a fun game using angles.

5. Computer checked.

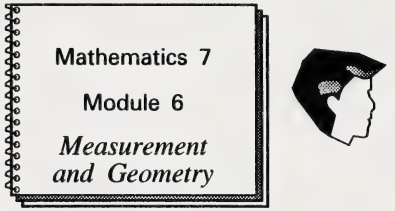
EQUIVALENT MEASURES

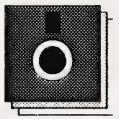
What Lies Ahead

In this section the student will learn to convert from one linear unit to another.

Gathering Materials

The student will need these items for this section.





(Optional)

SRA *Computer Drill and Instruction: Mathematics*, Level D "Measurement" disk lesson

Guiding the Student

- Have the student turn to Section 12 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

Computer Alternative

1. Do Lessons 3-9 from the Measurement disk of the package *Computer Drill and Instruction: Mathematics,* Level D.

Print Alternative

2. Complete.

   a. 24 cm = _____ mm

   b. 129 m = _____ m

   c. 4 L = _____ mL

   d. 412 g = _____ kg

   e. 316 m = _____ cm

   f. 4.8 kg = _____ g

   g. 95 mL = _____ L

   h. 75 g = _____ mg

Suggested Answers

1. Computer checked.

2. a. 24 cm = 240 mm

   b. 129 mm = 0.129 m

   c. 4 L = 4000 mL

   d. 412 g = 0.412 kg

   e. 316 m = 31 600 cm

   f. 4.8 kg = 4800 g

   g. 95 mL = 0.095 L

   h. 75 g = 75 000 mg

3. Complete the charts.

a.

m	cm	mm
5.25		
	121.7	
		4392

b.

kg	g	mg
7.9		
	80	
		702

c.

kL	L	mL
2.542		
	3	
		85

3. a.

m	cm	mm
5.25	525	5250
1.217	121.7	1217
4.392	439.2	4392

b.

kg	g	mg
7.9	7900	7 900 000
0.08	80	80 000
0.000702	0.702	702

c.

kL	L	mL
2.542	2542	2 542 000
0.003	3	3000
0.000085	0.085	85

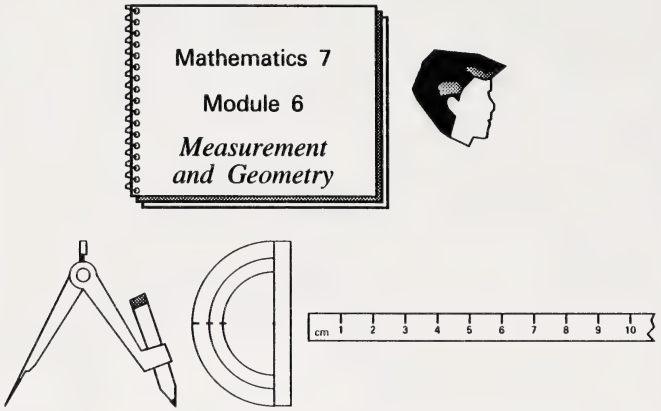
SUMMARY

What Lies Ahead

In the summary the student will review the skills taught in Sections 1-12.

Gathering Materials

The student will need these items for this section.



Guiding the Student

- Have the student turn to the Summary and review the skills taught in Sections 1-12.
- Then have the student turn Section 1 and review the Pretest.
- Afterwards, have the student correct any errors he or she may have made at the time.

GETTING SET

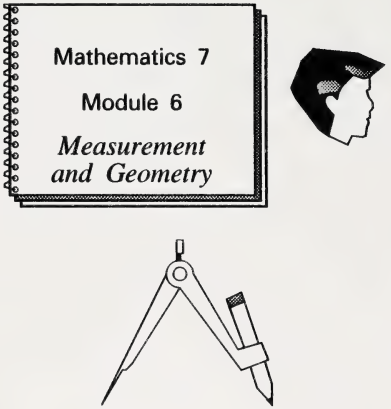
What Lies Ahead

This section tests these concepts.

- slides, flips, turns
- congruent figures
- similar figures
- flip and turn symmetry
- tiling
- compass and computer designs

Gathering Materials

These items will be needed.



Guiding the Student

- Have the student turn to Section 14 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Pretest.
- Afterwards, help the student check the answers. It may not be necessary for the student to correct errors.

Pretest

1. What transformation (slides, turns, or flips) are suggested by the following?

   a. moving furniture into a new house

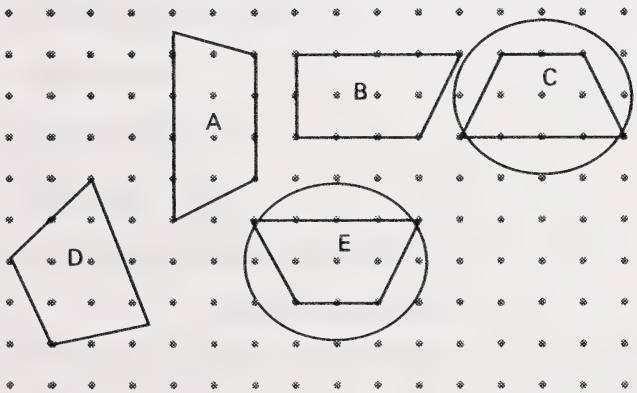
   b. playing both sides of a record

   c. resetting your watch

   d. raising a flag up a flag pole

   e. playing chess or checkers

2. Circle the congruent figures.



Suggested Answers

1. a. slides, turns

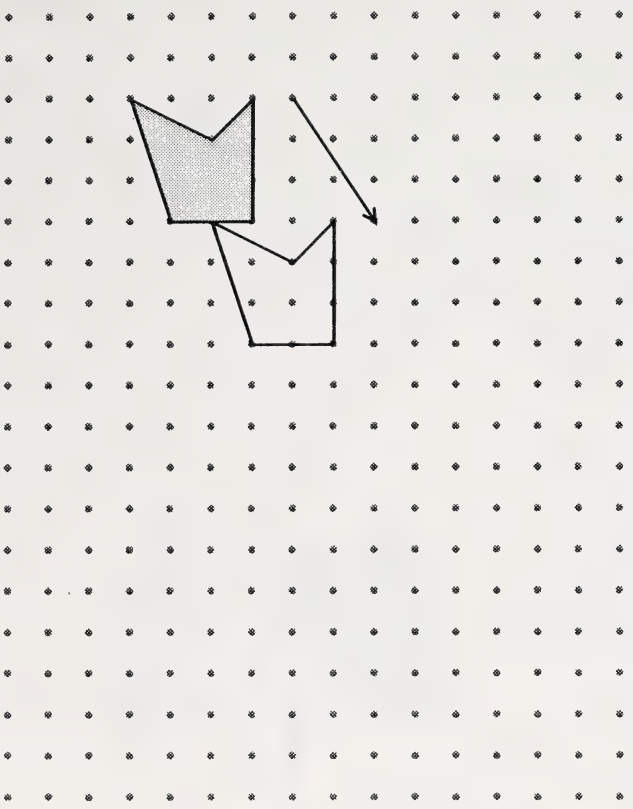
   b. flips

   c. turns

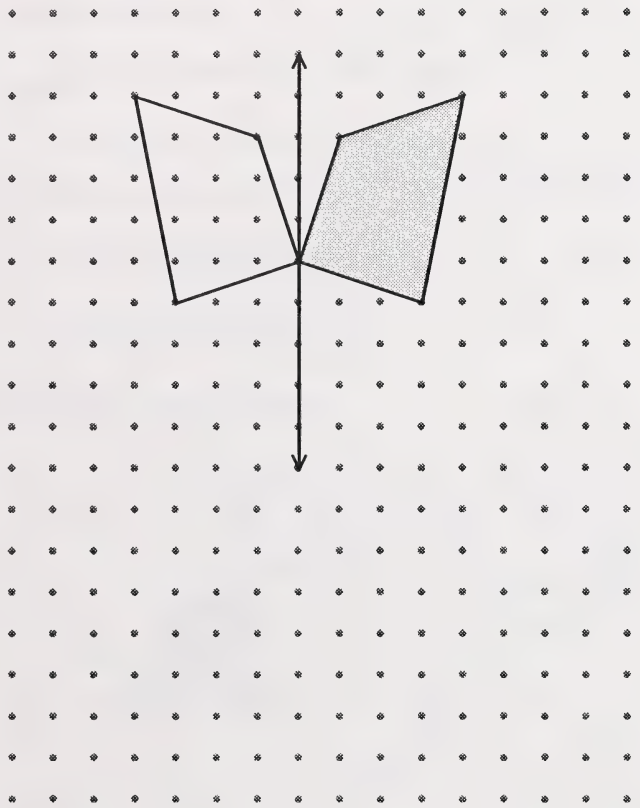
   d. slides

   e. slides

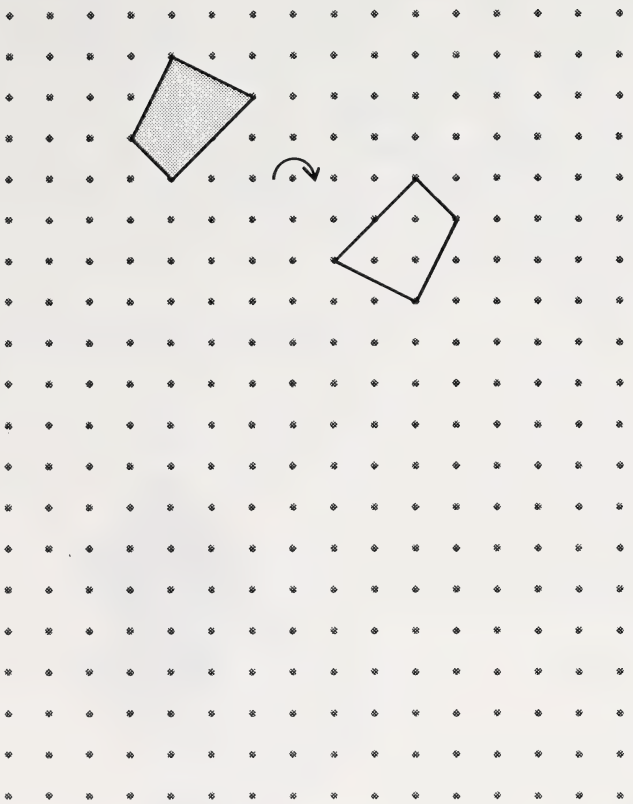
3. Draw the slide image for the given slide arrow. (You may use the tracing paper provided at the end of the booklet.)



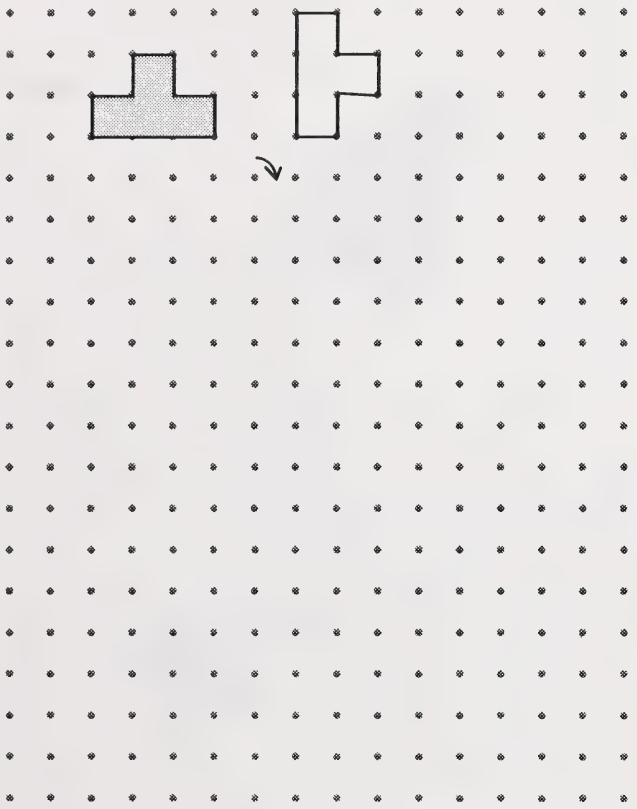
4. Draw the flip image for the given flip line. (You may use the tracing paper provided at the end of the booklet.)



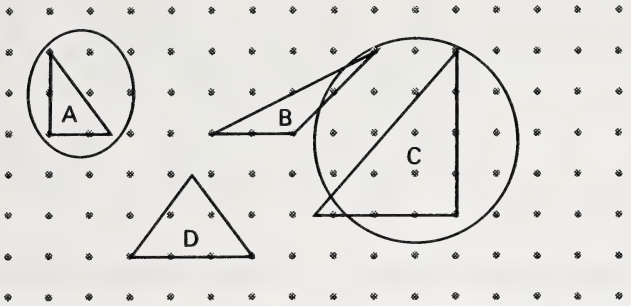
5. Draw the $\frac{1}{2}$-turn image for the given turn centre. You may use the tracing paper provided at the end of the booklet.



6. Draw the $\frac{1}{4}$-turn image for the given turn angle. You may use the tracing paper provided at the end of the booklet.

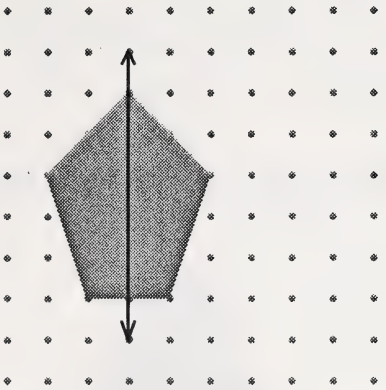


7. Circle the similar figures.



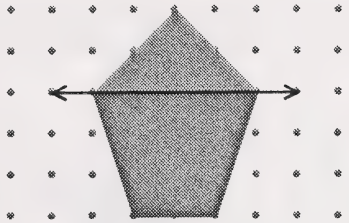
8. Is this line a line of symmetry?

a.



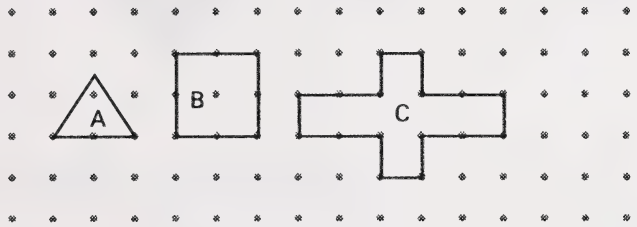
8. a. yes

b.



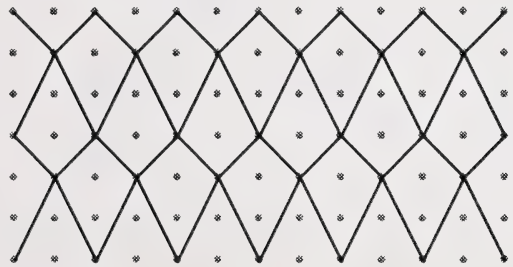
b. no

9. Which figure has a turn order of two?



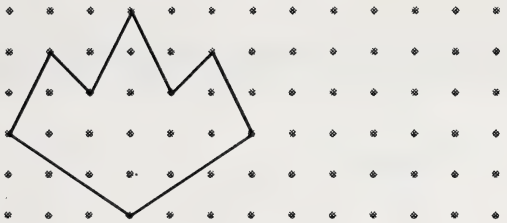
9. C

10. How many different shapes are used to make this tiling pattern?

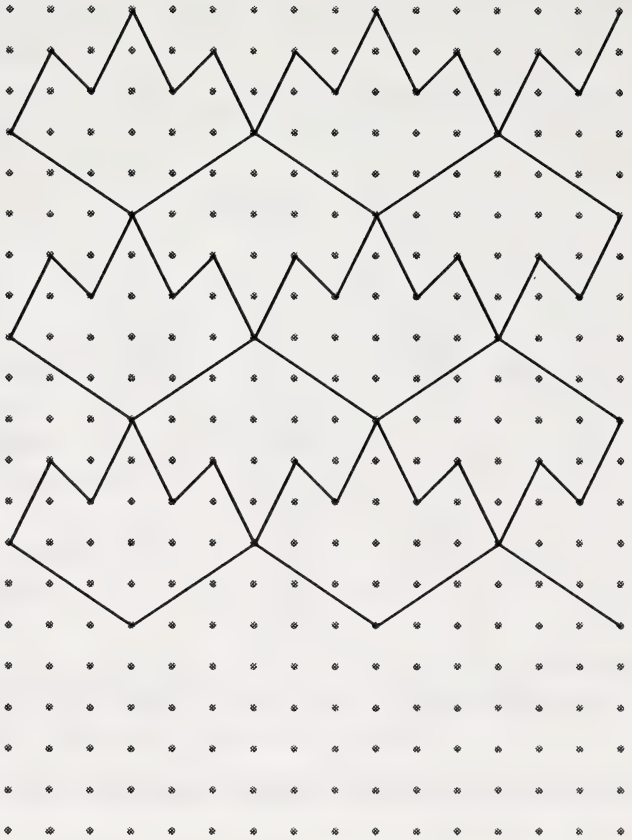


10. one

11. Create a tesselation with this shape.

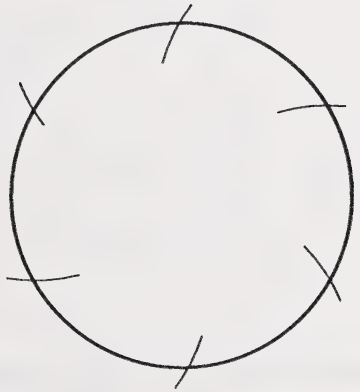


11.

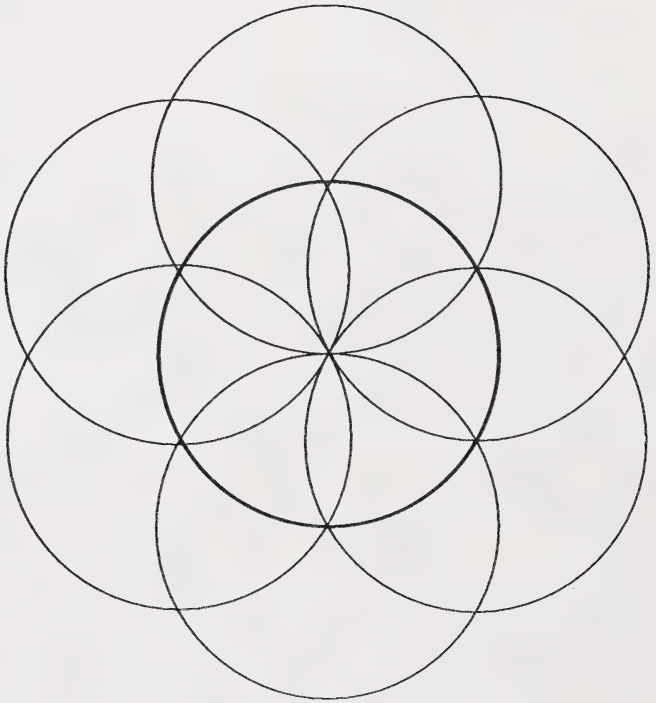


12. Construct this design with a compass. (You can make the design larger.)

Step 1: Keep the compass setting used to draw the circle. Separate the circumference into **6** equal arcs.



Step 2: Place the compass point on each of the arcs and draw a circle.



Guiding the Student

After checking the answers, compare the student's results with the following chart. (The chart lists the skills covered in the Pretest and the section in which the skill will be taught.)

Question	Skill	Section
1, 2	Drawing slide images	15
3	Drawing flip images	16
4, 5	Drawing turn images	17
6	Identifying congruent figures	18
7	Identifying similar figures	19
8	Identifying lines of symmetry	20
9	Identifying order of turn symmetry	21
10	Making tiling designs	22
11	Deciding if a figure will tesselate	22
12	Constructing compass designs	23

Help the student to decide what to do next. It is recommended that the student does most of the sections which correspond to the questions with which the student experienced difficulties and only the concluding activities in the section which corresponds to the questions with which the student experienced success.

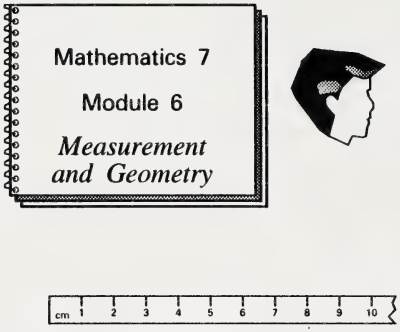
SLIDES

What Lies Ahead

In this section the student will learn to draw the slide image of an object.

Gathering Materials

The student will need these.



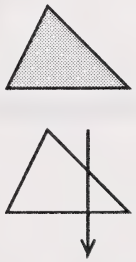
Guiding the Student

- Have the student turn to Section 15 in the module booklet.
- Next have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers and correct any errors.

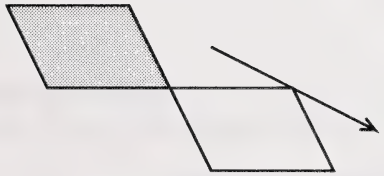
Introductory Activities

Draw the slide image of the figures for the given slide arrow. Use the tracing paper provided at the end of this booklet.

1.

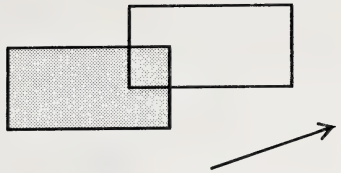


2.

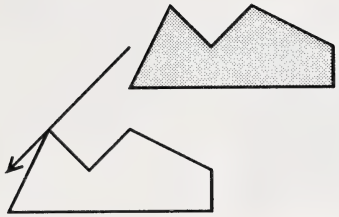


Suggested Answers

3.



4.



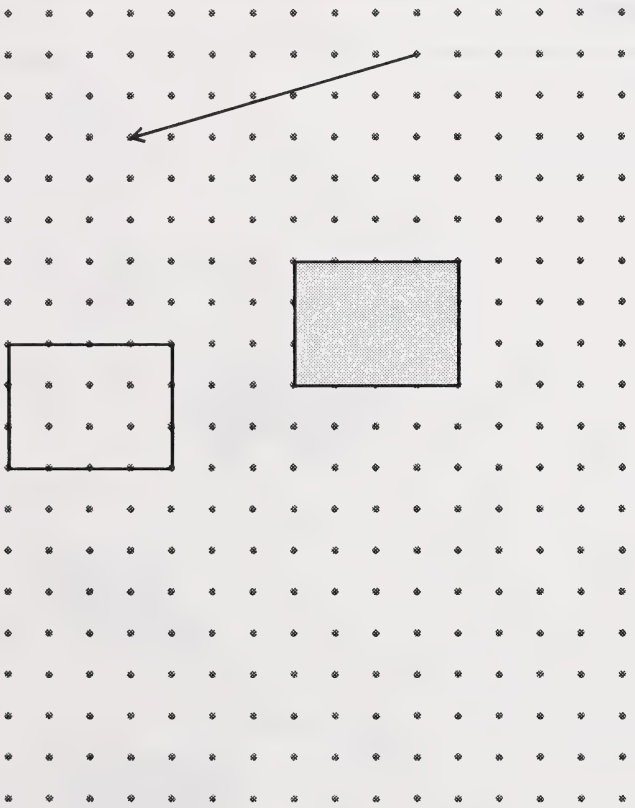
Guiding the Student

- Have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

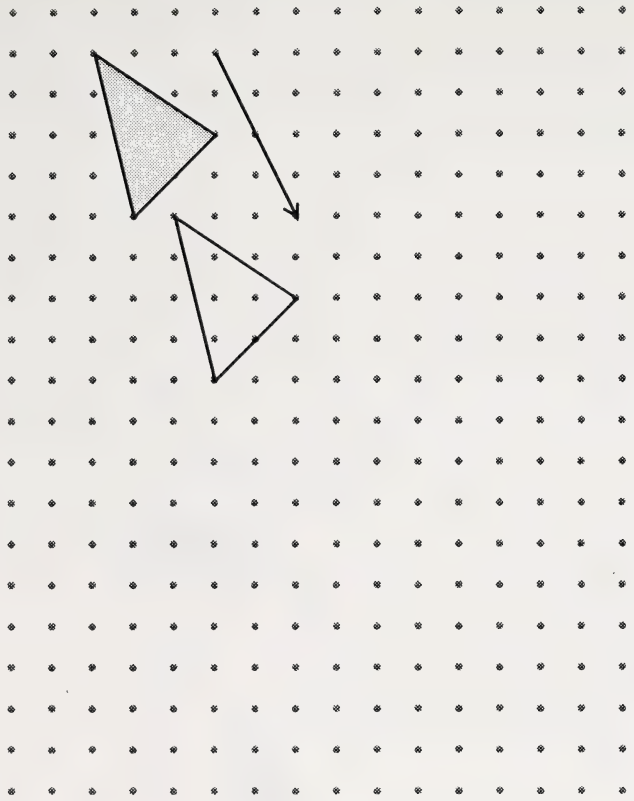
Draw the slide images for the given slide arrows.

1.

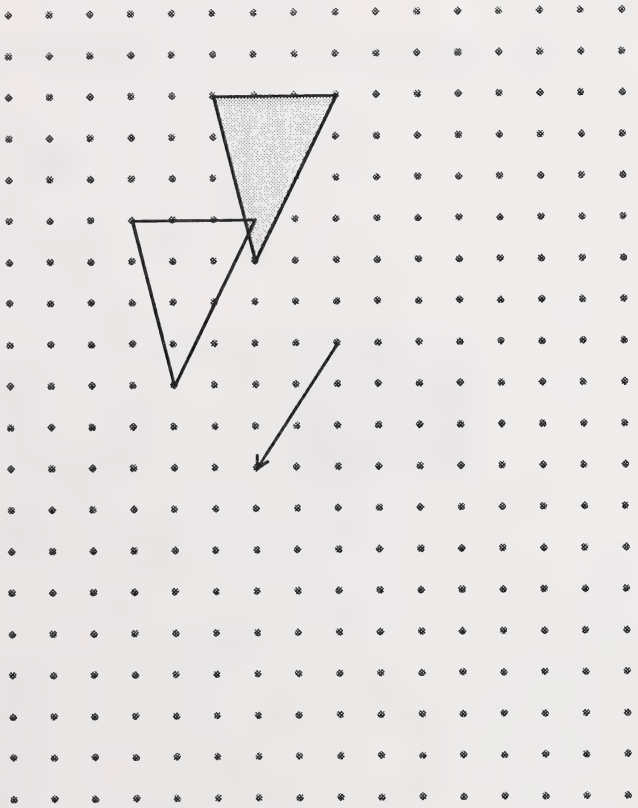


Suggested Answers

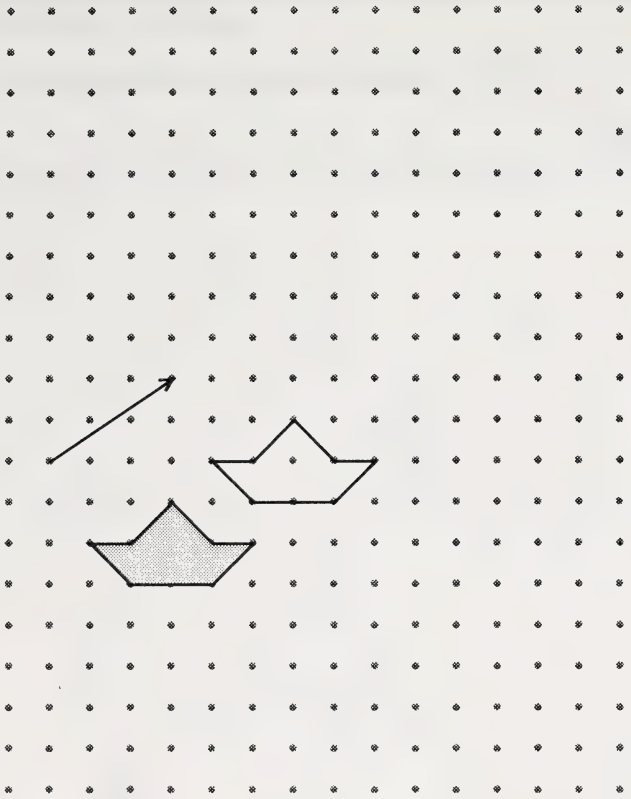
2.



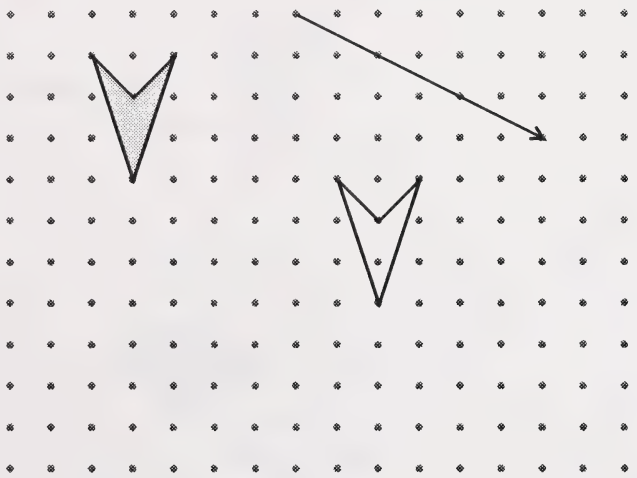
3.



4.



5. Draw the slide arrow for the following figure and slide image.



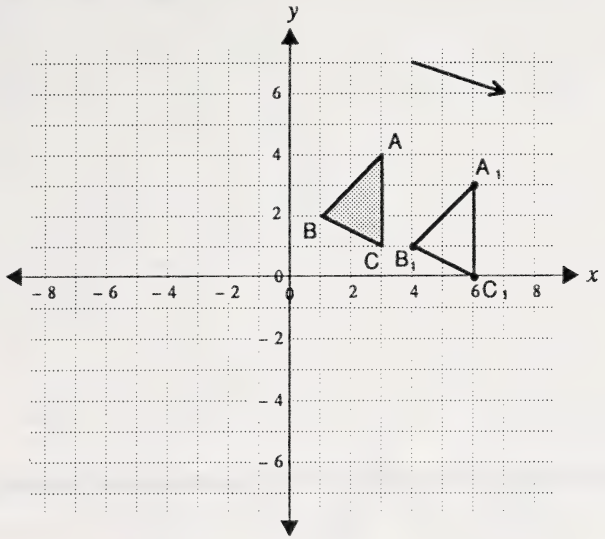
Guiding the Student

- Have the student do the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

1. Slide images can be drawn on graph paper.

   a. Write the coordinates of the vertices of the triangle and its slide image in the table at the right.



   b. The slide arrow shows the figure has been moved right 3 and down 1. What pattern do you see in the coordinates of the corresponding vertices (that is, A and A_1, B and B_1, C and C_1)?

Suggested Answers

1. a.

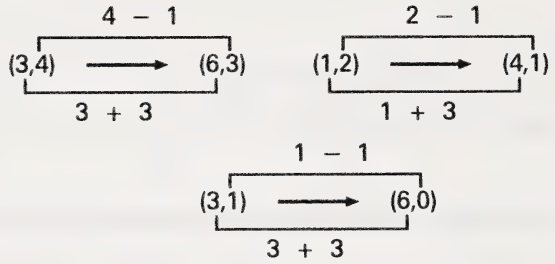
Triangle

vertex	coordinates
A	(3,4)
B	(1,2)
C	(3,1)

image

vertex	Image
A_1	(6,3)
B_1	(4,1)
C_1	(6,0)

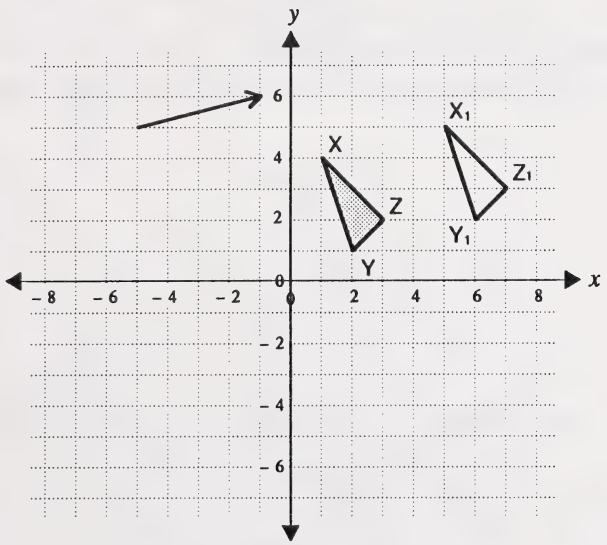
   b. Pattern



Pattern $(x,y) \longrightarrow (x + 3, y - 1)$

You add 3 to the first number in the order pair. You subtract 1 from the second number. This corresponds to the slide arrow (right 3 and down 1).

2. Draw the slide image after a slide of right 4 and up 1.



2.

Triangle

vertex	coordinates
X	(1,4)
Y	(2,1)
Z	(3,2)

image

vertex	Image
X_1	(5,5)
Y_1	(6,2)
Z_1	(7,3)

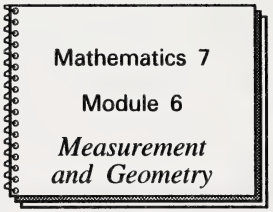
FLIPS

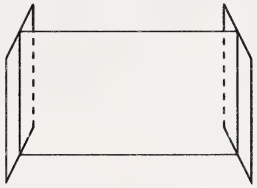
What Lies Ahead

In this section the student will learn to draw the flip image of an object.

Gathering Materials

These items will be needed.





If the student doesn't have a MIRA, he/she can use a rectangular piece of plexiglass.

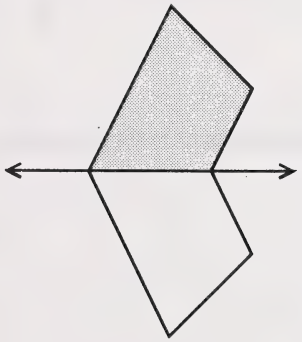
Guiding the Student

- Have the student turn to Section 16 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers and correct any errors.

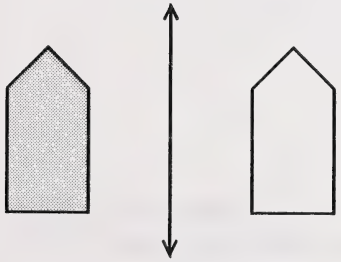
Introductory Activities

Draw the flip image for the given flip line. Use tracing tracing paper provided at the end of this booklet.

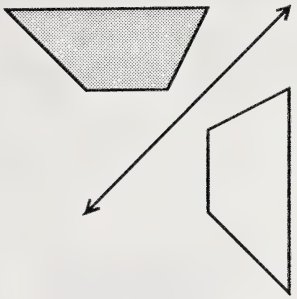
1.

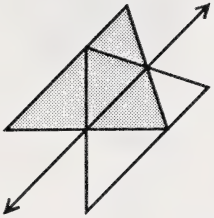


2.



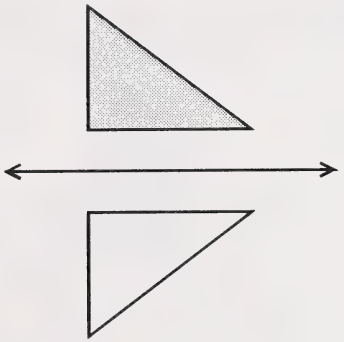
Suggested Answers

3. 

4. 

5. Draw the flip images for the given flip line. Use a MIRA.

a.



b.

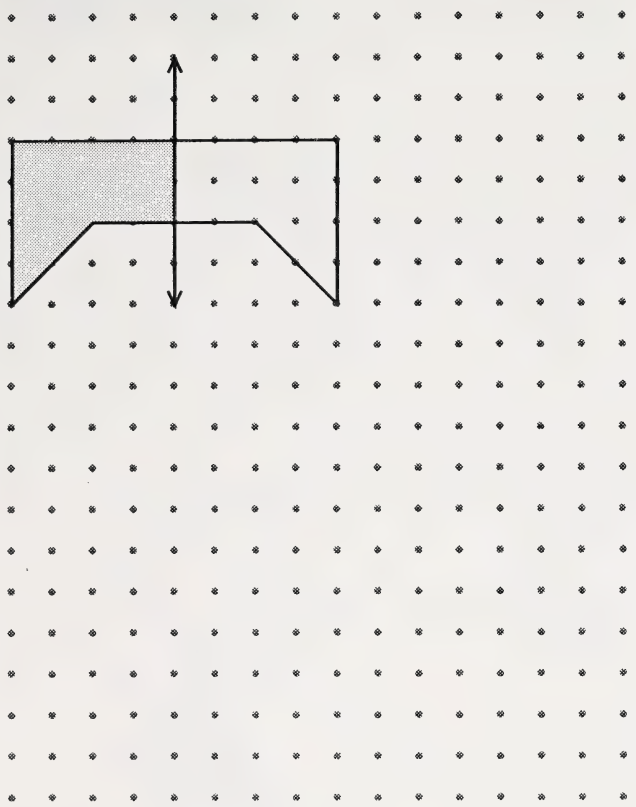
Guiding the Student

- Next have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

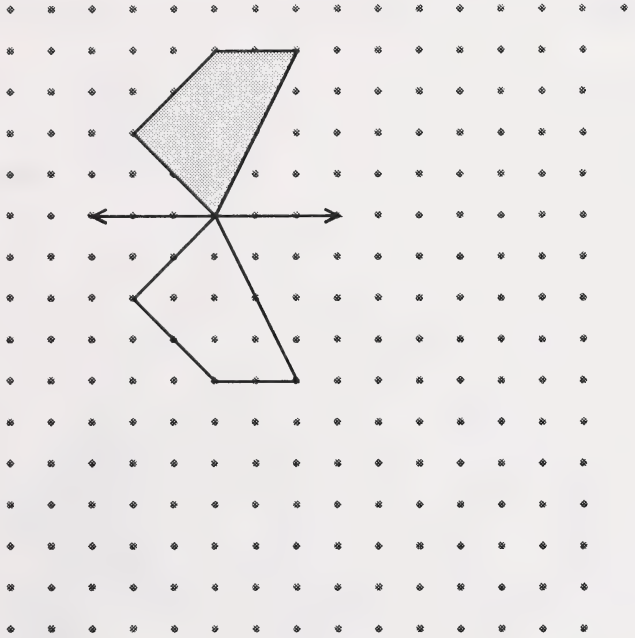
1. Draw the flip images for the given flip lines.

a.

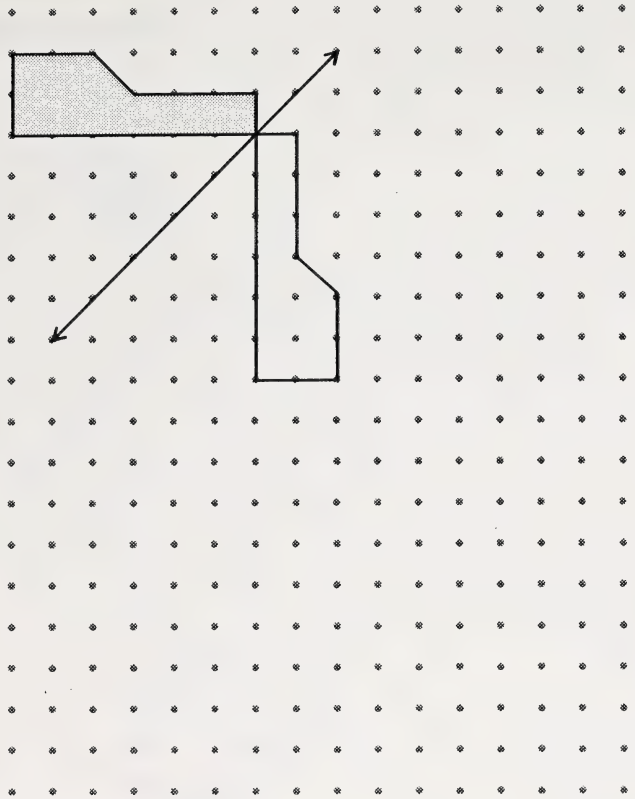


Suggested Answers

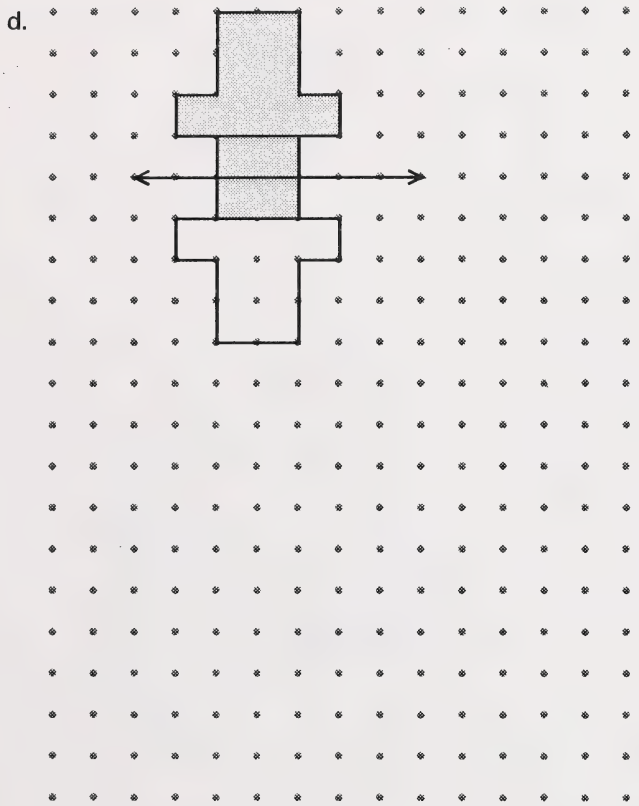
b.



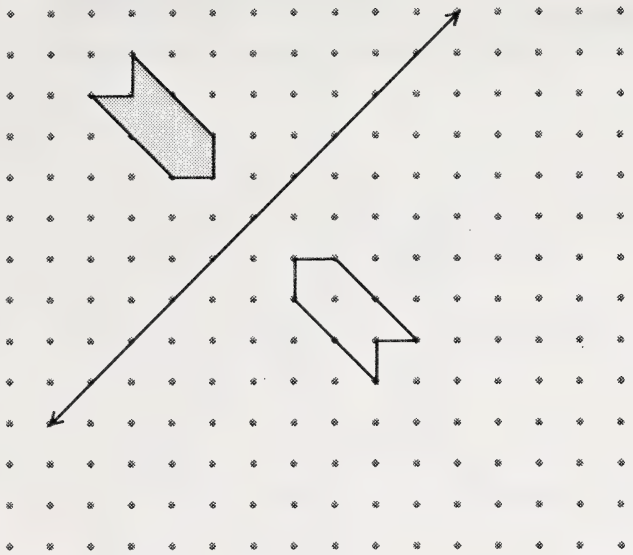
c.



d.



2. Show the flip line.



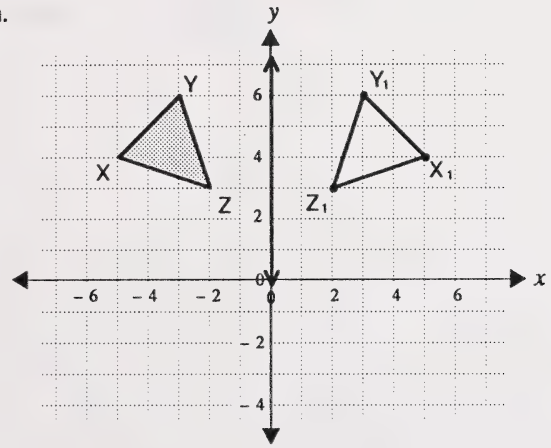
Guiding the Student

- Next have the student do the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

1. Flips can also be shown on graph paper.

a.



b. The flip line is on the vertical axis. What pattern do you notice in the coordinates of the corresponding vertices (X and X_1, Y and Y_1, Z and Z_1)?

Suggested Answers

1. a.

Triangle

vertex	coordinates
X	(–5,4)
Y	(–3,6)
Z	(–2,3)

Image

vertex	coordinates
X_1	(5,4)
Y_1	(3,6)
Z_1	(2,3)

b. Pattern

same
(–5,4) → (5,4)
opposites

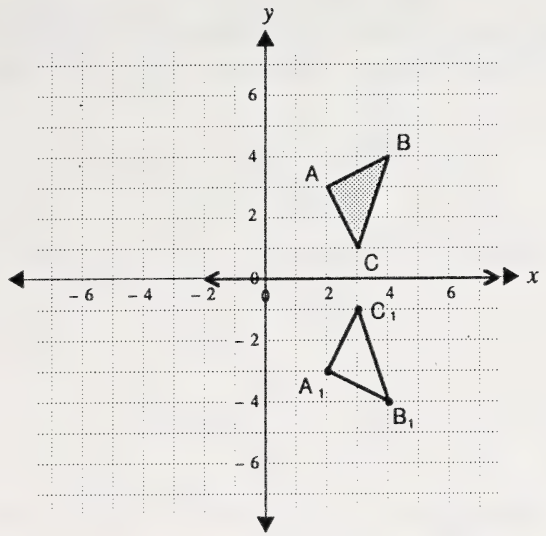
same
(–3,6) → (3,6)
opposites

same
(–2,3) → (2,3)
opposites

(x,y) → (–x,y)

When the flip line is on the vertical axis, the first numbers in the ordered pairs are opposite and the second numbers in the ordered pairs are the same.

2. a. Write the ordered pairs for the triangle and its flip image in the table at the right.



b. The flip line is on the horizontal axis. What pattern do you notice in the coordinates of the corresponding vertices?

2. a.

Triangle

vertex	coordinates
A	(2,3)
B	(4,4)
C	(3,1)

Image

vertex	coordinates
A_1	(2, – 3)
B_1	(4, – 4)
C_1	(3, – 1)

b. Pattern

same: (2,3) ⟶ (2, – 3); opposites

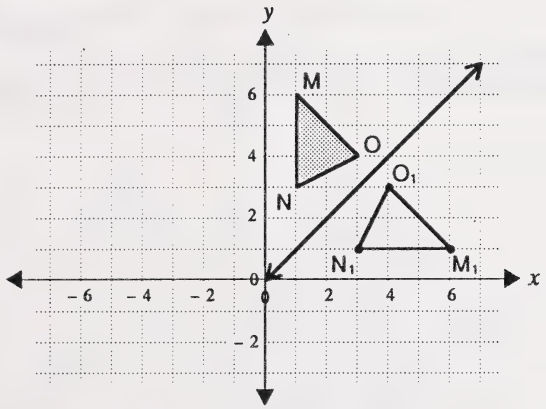
same: (4,4) ⟶ (4, – 4); opposites

same: (3,1) ⟶ (3, – 1); opposites

$(x,y) \longrightarrow (x, -y)$

When the flip line is on the horizontal axis, the first numbers in the ordered pairs are same and the second numbers in the ordered pairs are opposites.

3. a. Write the ordered pairs for the triangle and its flip image in the table at the right.



b. The flip line is at a 45° angle with the horizontal and vertical axis. What pattern do you notice with the coordinates of the corresponding angles?

3. a.

Triangle

vertex	coordinates
M	(1,6)
N	(1,3)
O	(3,4)

Image

vertex	coordinates
M_1	(6,1)
N_1	(3,1)
O_1	(4,3)

b. (1,6) ⟶ (6,1)

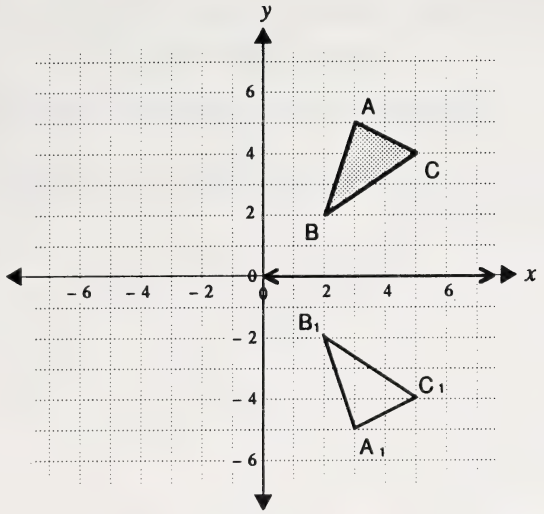
(1,3) ⟶ (3,1)

(3,4) ⟶ (4,3)

(x,y) ⟶ (y,x)

The numbers in the ordered pairs are reversed.

4. Draw the flip image of this triangle. The flip line is on the horizontal axis.



4.

Triangle

vertex	coordinates
A	(3,5)
B	(2,2)
C	(5,4)

Image

vertex	coordinates
A_1	(3, −5)
B_1	(2, −2)
C_1	(5, −4)

TURNS

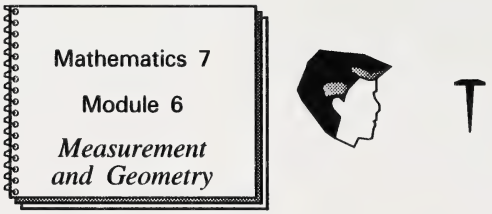
What Lies Ahead

In this section the student will learn this skill.

- drawing the turn image of an object

Gathering Materials

These items will be needed.



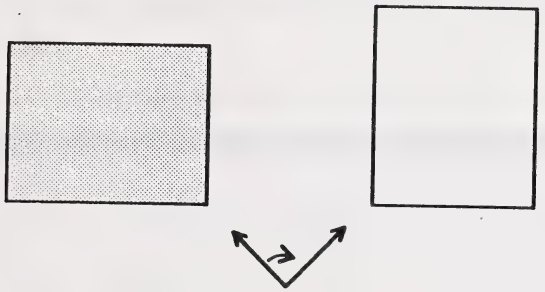
Guiding the Student

- Have the student turn to Section 17 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers and correct any errors.

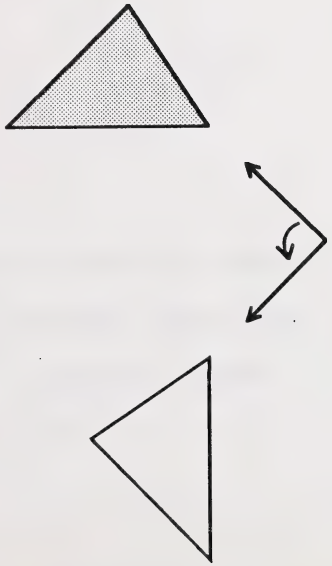
Suggested Answers to Introductory Activities

Draw the turn images of the figures for the given turn angles. Use the tracing paper provided.

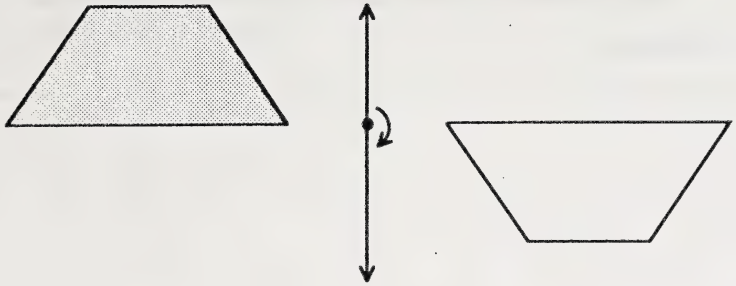
1.



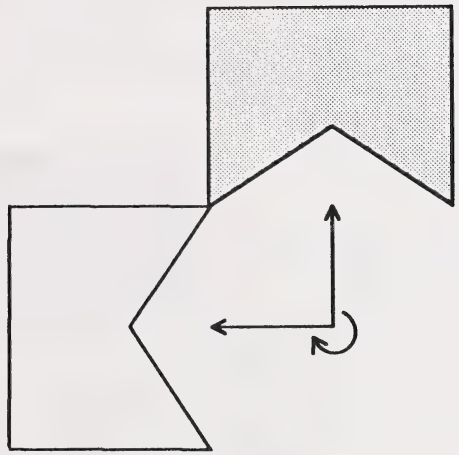
2.



3.



4.



Guiding the Student

- Next have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

1. What is the direction and amount of the following turn angles? (Use a fraction.)

a.

b.

c.

d.

Suggested Answers

1. a. $\frac{1}{2}$-turn cw

b. $\frac{1}{4}$-turn ccw

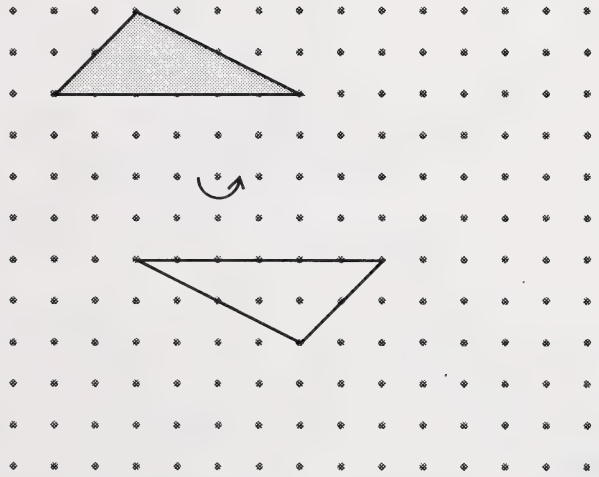
c. $\frac{1}{2}$-turn ccw

d. $\frac{3}{4}$-turn cw

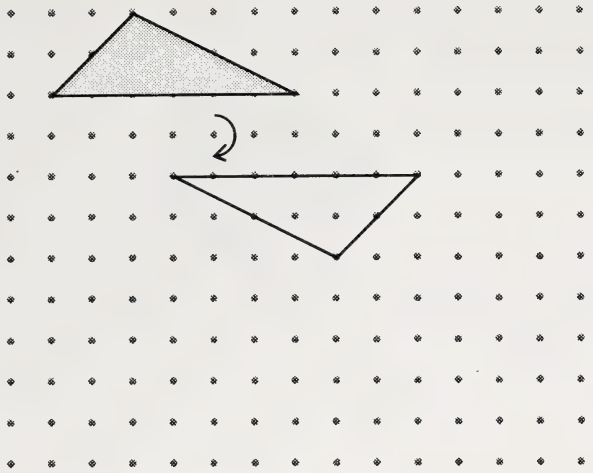
2. Show a $\frac{3}{4}$-turn ccw at the turn centre.

3. Draw the $\frac{1}{2}$ turn angles.

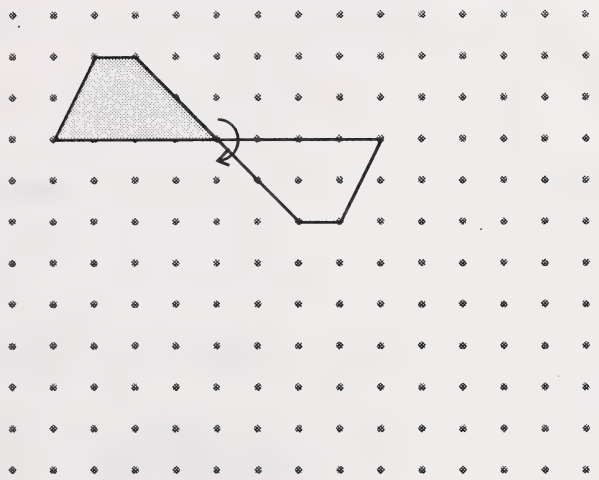
a.



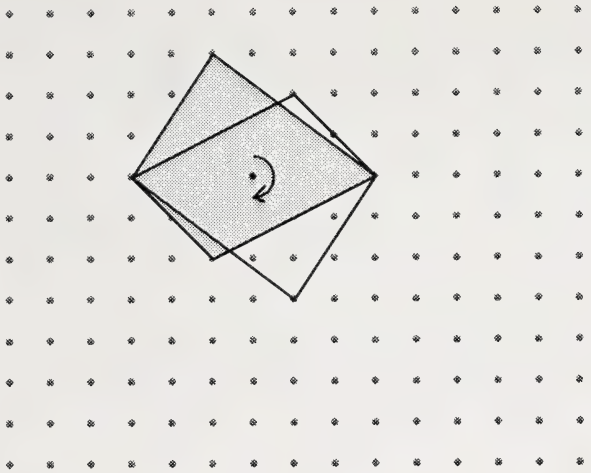
b.



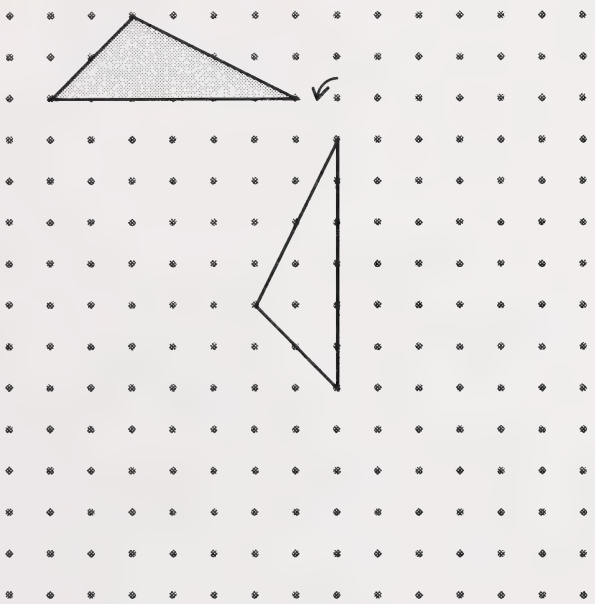
c.



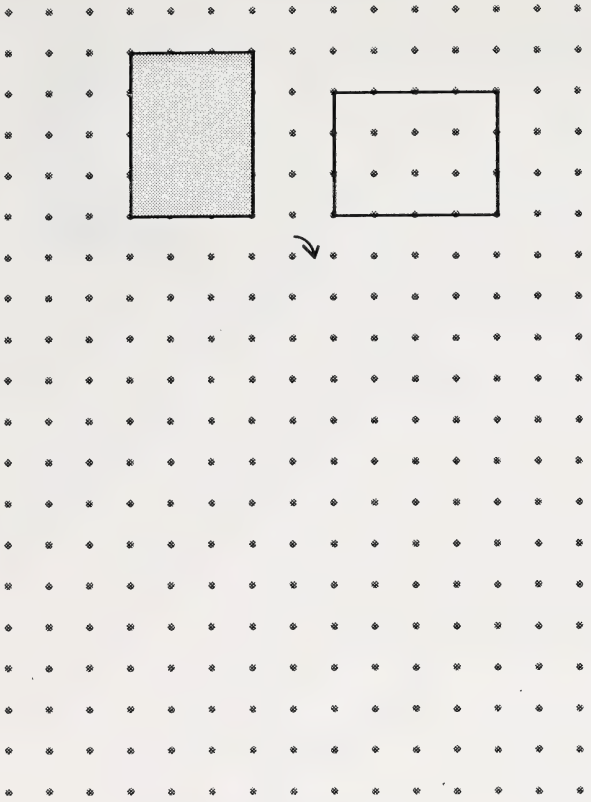
d.



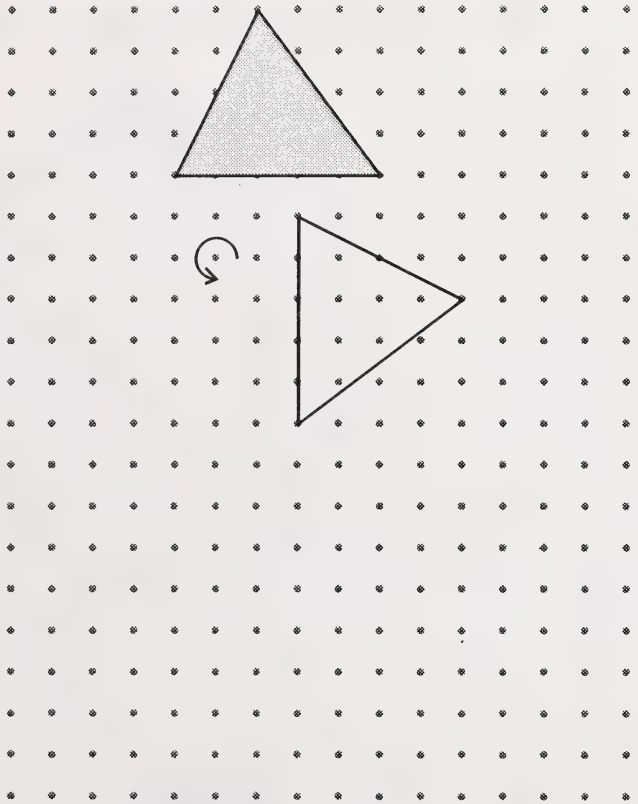
4. Draw the turn images for the given turn angles.

a. 

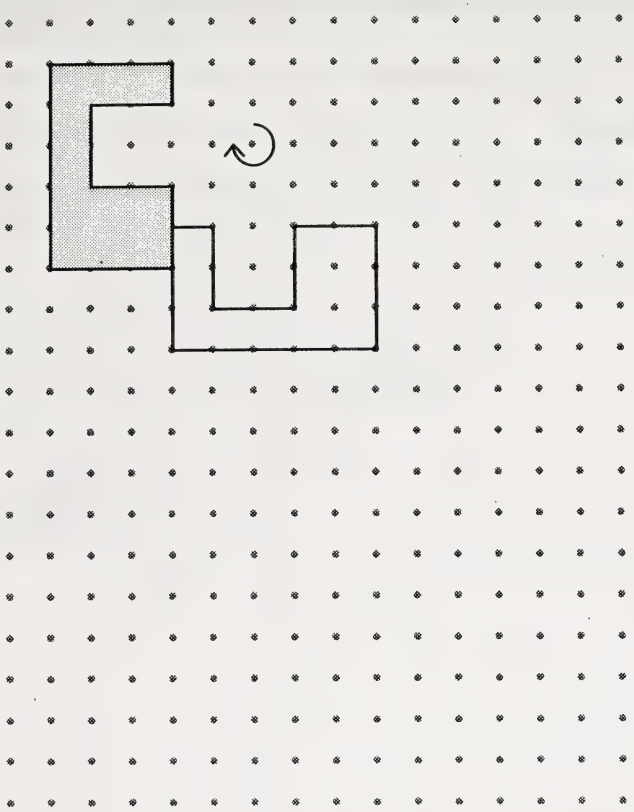
b.



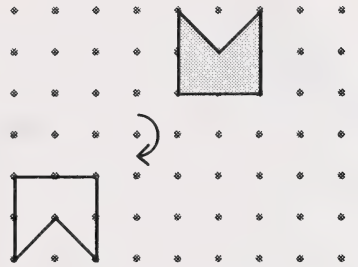
c.



d.

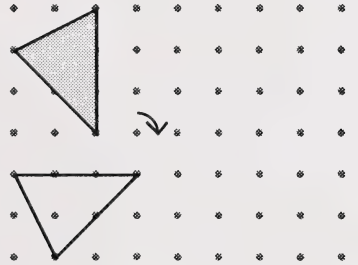


5. Give the turn angle for the following.

a. 

Note

The turn angle is a $\frac{1}{2}$ turn, but it can be clockwise as shown, or counterclockwise.

b. 

Note

The turn angle could also be described as a $\frac{3}{4}$ turn clockwise.

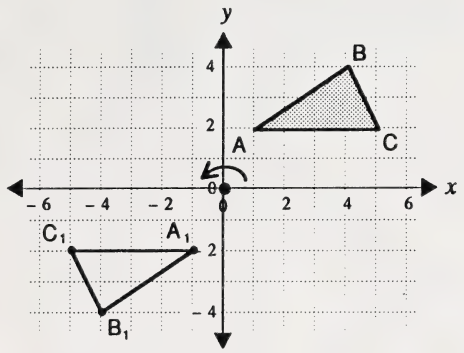
Guiding the Student

- Next have the student do the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

1. You can show turn images on graph paper.

   a. Write the coordinates of the vertices of the triangle and its turn image in the tables at the right.



   b. The turn centre is at the origin and the turn image is $\frac{1}{2}$-turn ccw. What pattern do you notice in the coordinates of the corresponding vertices (A and A_1, B and B_1, C and C_1)?

Suggested Answers

1. a.

Triangle

vertex	coordinates
A	(1,2)
B	(4,4)
C	(5,2)

Image

vertex	coordinates
A_1	(−1,−2)
B_1	(−4,−4)
C_1	(−5,−2)

   b. Pattern

   (1,2) ⟶ (−1,−2)

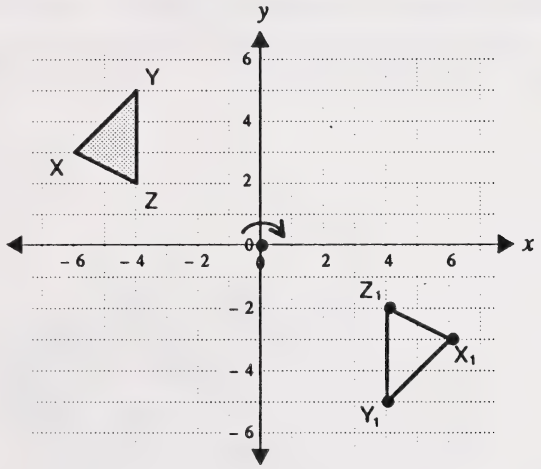
   (4,4) ⟶ (−4,−4)

   (5,2) ⟶ (−5,−2)

   (x,y) ⟶ (−x,−y)

   When the turn centre is at the origin and a $\frac{1}{2}$-turn is made, the numbers in the corresponding ordered pairs are opposites.

2. Draw the $\frac{1}{2}$-turn image of the triangle. The turn centre is at the origin.



2.

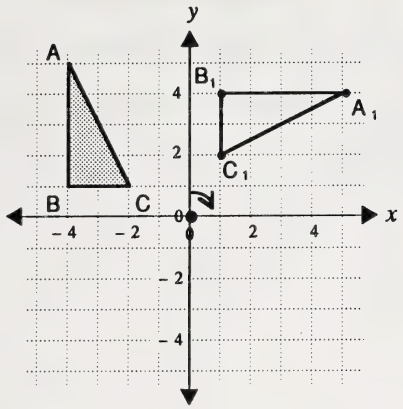
Triangle

vertex	coordinates
X	(−6,3)
Y	(−4,5)
Z	(−4,2)

Image

vertex	coordinates
X_1	(6,−3)
Y_1	(4,−5)
Z_1	(4,−2)

3. a. Write the coordinates of the vertices of the triangle and its turn image in the tables at the right.



b. The turn centre is at the origin and the turn angle is $\frac{1}{4}$-turn cw. What pattern do you notice in the coordinates of the corresponding vertices (A and A_1, B and B_1, C and C_1)?

3. a.

Triangle

vertex	coordinates
A	(−4,5)
B	(−4,1)
C	(−2,1)

Image

vertex	coordinates
A_1	(5,4)
B_1	(1,4)
C_1	(1,2)

b. Pattern

opposites
(−4,5) ⟶ (5,4)
same

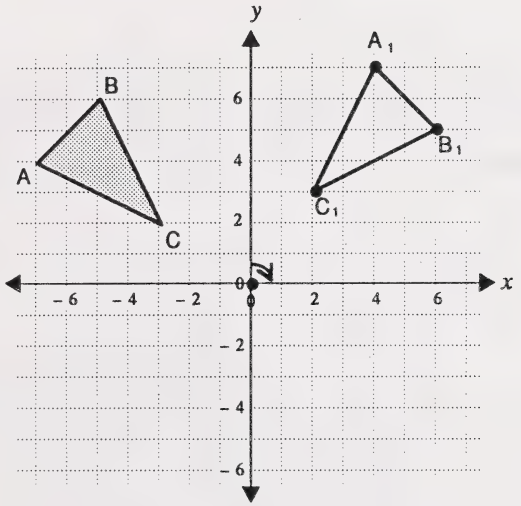
opposites
(−4,1) ⟶ (1,4)
same

opposite
(−2,1) ⟶ (1,2)
same

(x,y) ⟶ (y, −x)

When the turn centre is the origin and a $\frac{1}{4}$-turn is made, the first number in the ordered pair is the opposite of the second number in the corresponding ordered pair, and the second number in the ordered pair is the same as the first number in the corresponding ordered pair.

4. Draw the $\frac{1}{4}$-turn image of the triangle. The turn centre is at the origin.



4.

Triangle

vertex	coordinates
A	(–7,4)
B	(–5,6)
C	(–3,2)

Image

vertex	coordinates
A_1	(4,7)
B_1	(6,5)
C_1	(2,3)

CONGRUENT FIGURES

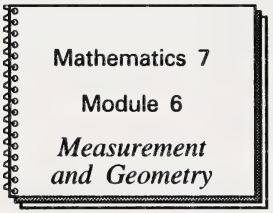
What Lies Ahead

In this section the student will learn these skills.

- interpreting what is meant by congruent figures
- testing to discover if two figures are congruent

Gathering Materials

These items will be needed.



Disk C of MAC 6 "Slides, Flips or Turns"

Guiding the Student

- Have the student turn to Section 18 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers and correct any errors.

Introductory Activities

1. Look at the figures labelled "Section 18 Figures" in the appendix of this booklet. Name the figures which appear to be congruent.

2. Cut out the figures. Then test to see if the figures are congruent. (Put two figures together. If they match exactly, they are congruent.)

Suggested Answers

1. A, D, and E are congruent.
   B and I are congruent.
   C and G are congruent.

2. A, D, and E are congruent.
   B and I are congruent.
   C and G are congruent.

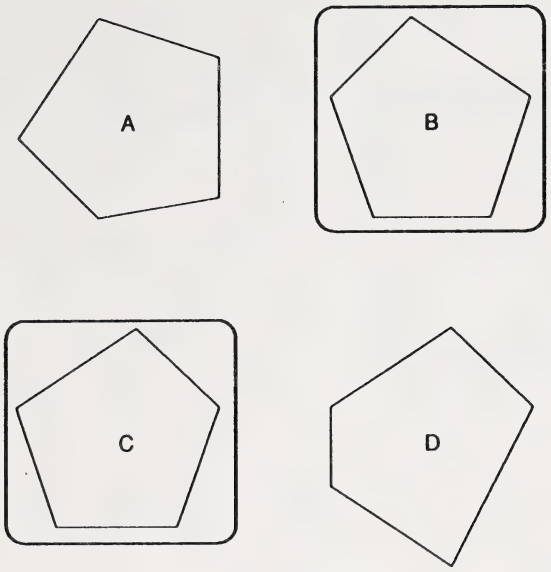
Guiding the Student

- Next have the student "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

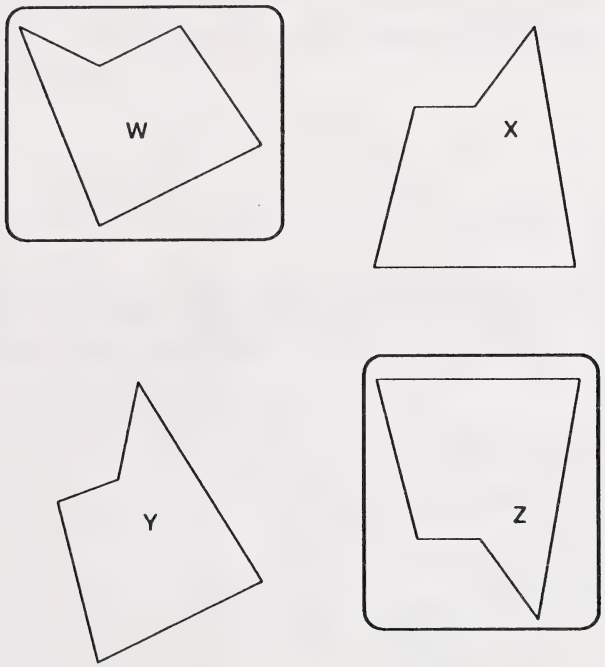
1. Use tracing paper to compare the figures. Circle the congruent figures.

   a.

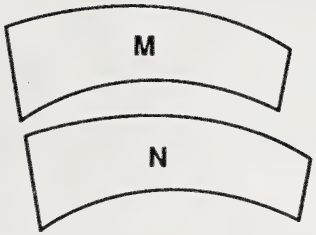


Suggested Answers

b.



2. Is the following pair of figures congruent? Be sure to test with tracing paper. You may be surprised.



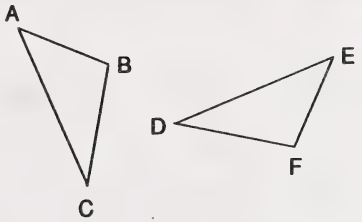
2. Yes, they are congruent.

Guiding the Student

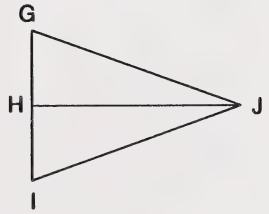
- Assign the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

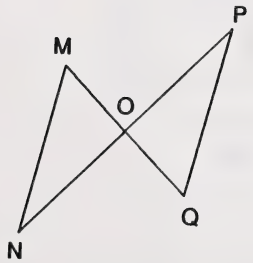
1.



2.



3.



Suggested Answers

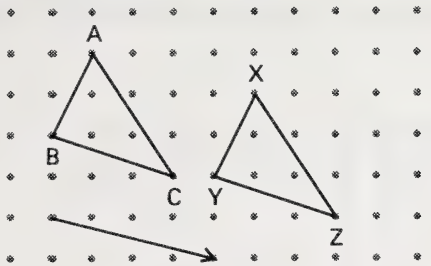
1. a. $\angle A \cong$ ___$\angle E$___ d. $\overline{AB} \cong$ ___$\overline{EF}$___
   b. $\angle B \cong$ ___$\angle F$___ e. $\overline{AC} \cong$ ___$\overline{DE}$___
   c. $\angle C \cong$ ___$\angle D$___ f. $\overline{BC} \cong$ ___$\overline{DF}$___
   $\triangle ABC \cong$ ___$\triangle EFD$___

2. a. $\angle G \cong$ ___$\angle I$___ d. $\overline{DJ} \cong$ ___$\overline{IJ}$___
   b. $\angle GHJ \cong$ ___$\angle JHI$___ e. $\overline{GH} \cong$ ___$\overline{HI}$___
   c. $\angle GJH \cong$ ___$\angle IJH$___ f. $\overline{HJ} \cong$ ___$\overline{HJ}$___
   $\triangle GHJ \cong$ ___$\triangle IHJ$___

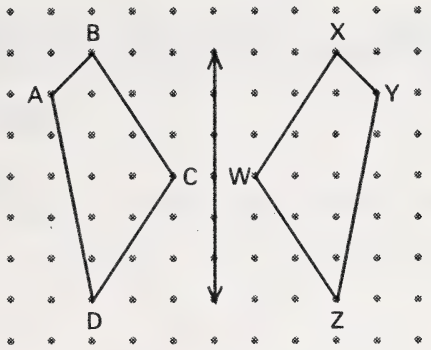
3. a. $\angle M \cong$ ___$\angle Q$___ d. $\overline{MO} \cong$ ___$\overline{OQ}$___
   b. $\angle N \cong$ ___$\angle P$___ e. $\overline{MN} \cong$ ___$\overline{PQ}$___
   c. $\angle MON \cong$ ___$\angle POQ$___ f. $\overline{MO} \cong$ ___$\overline{OP}$___
   $\triangle MNO \cong$ ___$\triangle QPO$___

4. You can use slides, flips, and turns to determine if figures are congruent. In each of the following identify the corresponding sides and corresponding angles.

a.



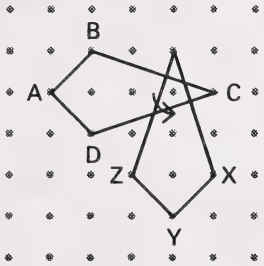
b.



4. a. $\angle A \cong \angle X$ $\quad \overline{AB} \cong \overline{XY}$
$\angle B \cong \angle Y$ $\quad \overline{AC} \cong \overline{XZ}$
$\angle C \cong \angle Z$ $\quad \overline{BC} \cong \overline{YZ}$

b. $\angle A \cong \angle Y$ $\quad \overline{AB} \cong \overline{XY}$
$\angle B \cong \angle X$ $\quad \overline{BC} \cong \overline{WX}$
$\angle C \cong \angle W$ $\quad \overline{CD} \cong \overline{WZ}$
$\angle D \cong \angle Z$ $\quad \overline{AD} \cong \overline{YZ}$

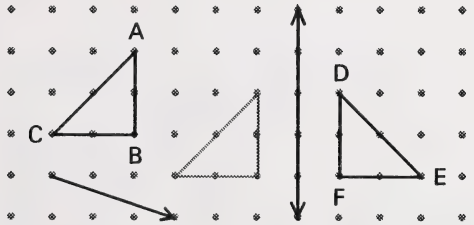
c.



5. Sometimes a series of slides, flips, or turns has been made.

Example

Triangles ABC and DEF are congruent. You can slide triangle ABC and then flip it onto triangle DEF.



For the following, identify the corresponding sides, corresponding angles, and vertices.

c. $\angle A \cong \angle Y$ $\overline{AB} \cong \overline{YZ}$
$\angle B \cong \angle Z$ $\overline{BC} \cong \overline{ZW}$
$\angle C \cong \angle W$ $\overline{CD} \cong \overline{WX}$
$\angle D \cong \angle X$ $\overline{AD} \cong \overline{YX}$

5. $\angle A \cong \angle Z$ $\overline{AB} \cong \overline{ZV}$
$\angle B \cong \angle V$ $\overline{BC} \cong \overline{VW}$
$\angle C \cong \angle W$ $\overline{CD} \cong \overline{WX}$
$\angle D \cong \angle X$ $\overline{DE} \cong \overline{XY}$
$\angle E \cong \angle Y$ $\overline{EA} \cong \overline{YZ}$

Computer Alternative

6. If you want to play a challenging game comparing figures using slides, flips, and turns, play "Slides, Flips and Turns" on Disk C of MAC 6.

6. Computer checked.

SIMILAR FIGURES

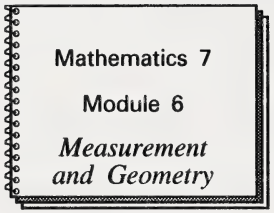
What Lies Ahead

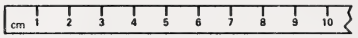
In this section the student will learn these skills.

- interpreting what is meant by similar figures
- testing to discover if two figures are similar

Gathering Materials

These items will be needed.



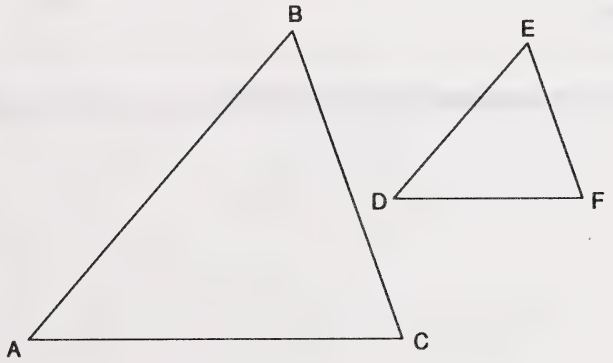


Guiding the Student

- Have the student turn to Section 19 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Introductory Activities.
- Afterwards, help the student check the answers and correct any errors.

Introductory Activities

The following figures are similar.



1. Measure the corresponding angles with a protractor.

   a. $\angle A$ and $\angle B$

   b. $\angle B$ and $\angle E$

   c. $\angle C$ and $\angle F$

Suggested Answers

1. a. $\angle A = 50°$ $\angle D = 50°$

   b. $\angle B = 60°$ $\angle E = 60°$

   c. $\angle C = 70°$ $\angle F = 70°$

2. Measure the size of the corresponding sides with a metric ruler.

   a. $\overline{AB}$ and $\overline{DE}$

   b. $\overline{BC}$ and $\overline{EF}$

   c. $\overline{AC}$ and $\overline{DF}$

2. a. $\overline{AB} = 6.5$ cm $\overline{DE} = 3.25$ cm

   b. $\overline{BC} = 5$ cm $\overline{EF} = 2.5$ cm

   c. $\overline{AC} = 6$ cm $\overline{DF} = 3$ cm

3. Calculate the ratios of the corresponding sides.

   a. $\overline{AB}$ to $\overline{DE}$

   b. $\overline{BC}$ to $\overline{EF}$

   c. $\overline{AC}$ to $\overline{DF}$

3. a. $\frac{6.5}{3.25} = \frac{6.5 \div 3.25}{3.25 \div 3.25} = \frac{2}{1}$

   b. $\frac{5}{2.5} = \frac{5 \div 2.5}{2.5 \div 2.5} = \frac{2}{1}$

   c. $\frac{6}{3} = \frac{6 \div 3}{3 \div 3} = \frac{2}{1}$

4. What can you conclude about similar figures?

4. If the figures are similar, corresponding angles are equal and corresponding sides are proportional.

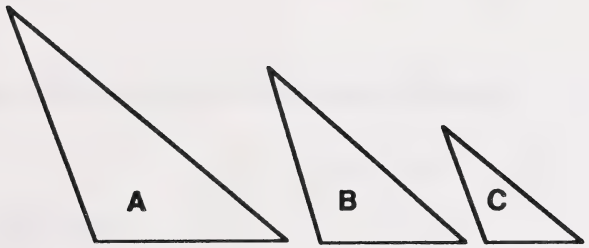
Guiding the Student

- Next have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

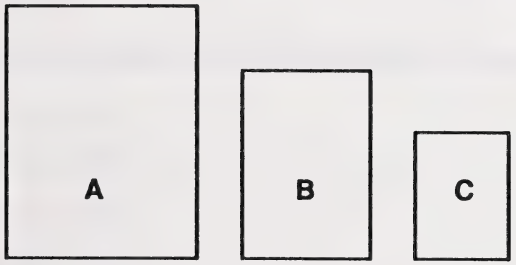
Practice Activities

Which of these figures are similar? (Use tracing paper to test.)

1.



2.

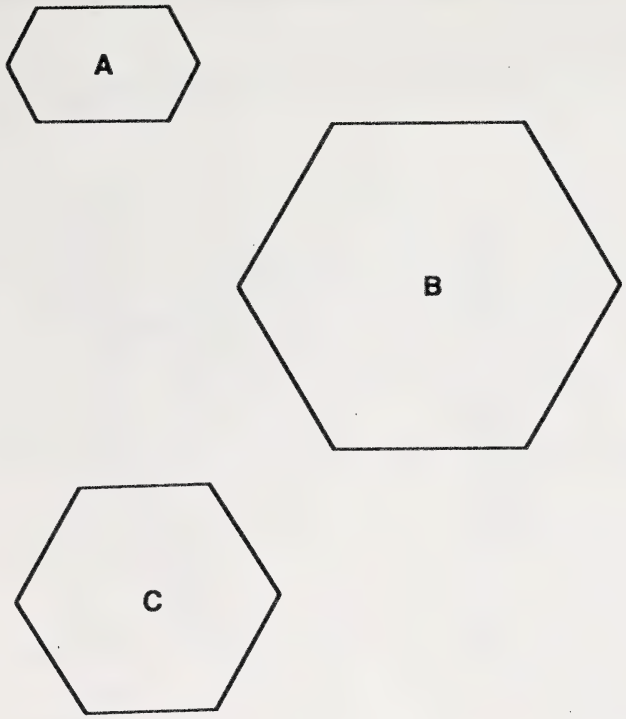


Suggested Answers

1. A and C

2. A and C

3.



3. B and C

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

1. With dot paper it is easy to draw similar figures.

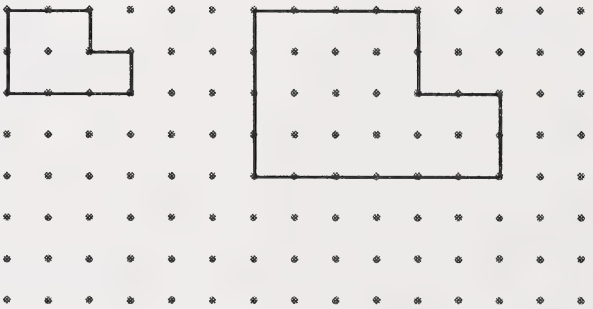
   On the dot paper at the right draw figures that are similar to the following.

a.

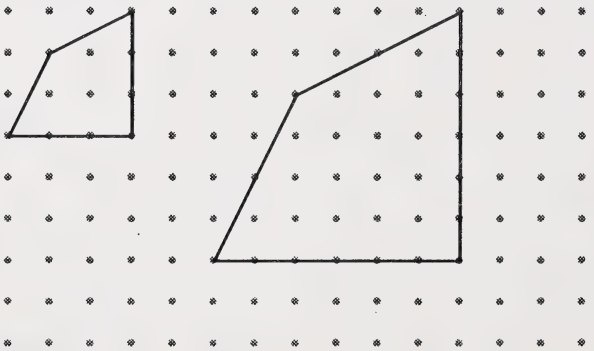
b.

Suggested Answers

1. a.

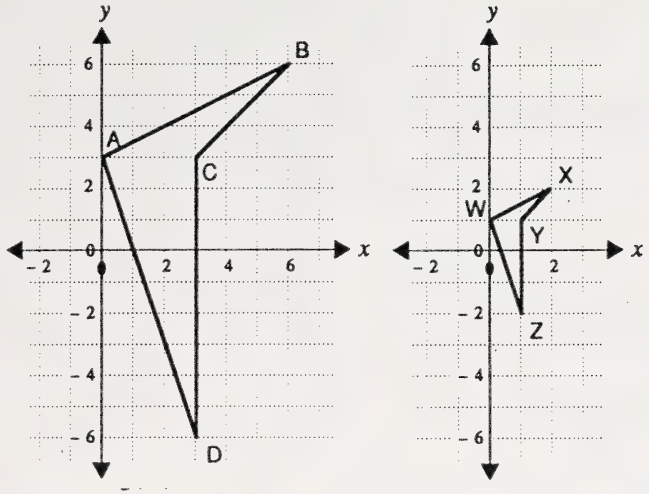


b.



2. With graph paper it is also easy to compare similar figures.

   a. Name the coordinates of these two figures in the charts to the right.



1. a.

Large Figure

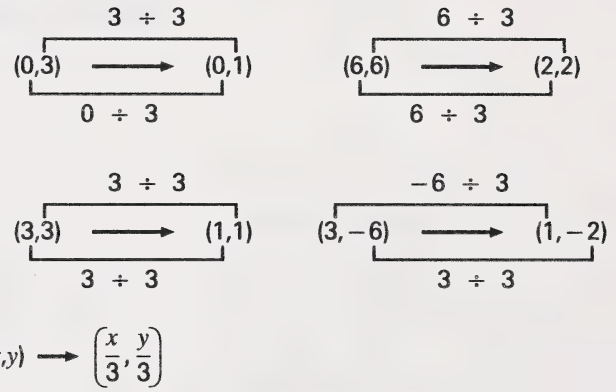
vertex	coordinates
A	(0,3)
B	(6,6)
C	(3,3)
D	(3, −6)

Small Figure

vertex	coordinates
W	(0,1)
X	(2,2)
Y	(1,1)
Z	(1, −2)

b. What do you notice about the corresponding coordinates?

b.



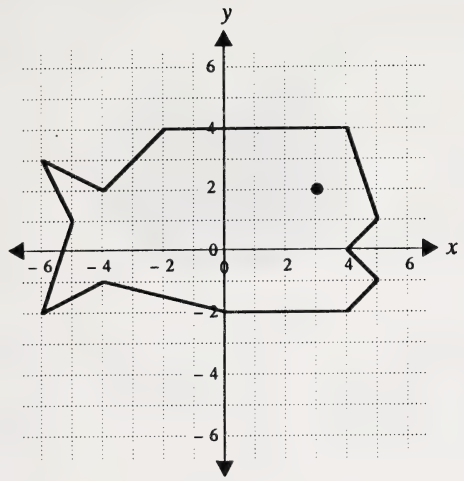
$(x,y) \longrightarrow \left(\frac{x}{3}, \frac{y}{3}\right)$

The numbers in the coordinates of the small figure are $\frac{1}{3}$ of the corresponding coordinates in the large figure.

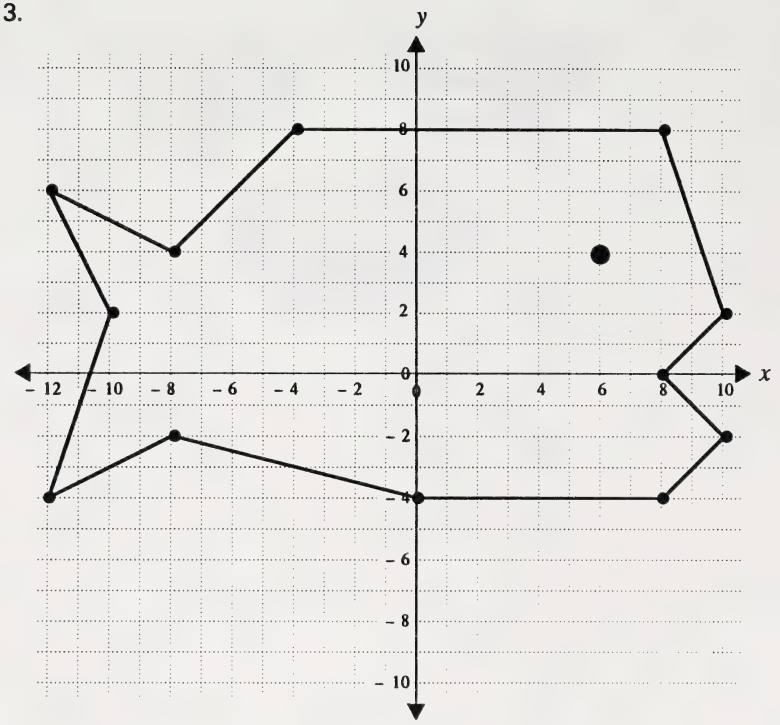
OR

The numbers in the coordinates of the large figure are 3 times the corresponding coordinates in the small figure.

3. Draw a figure similar to this using the graph paper.

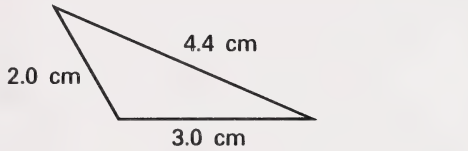


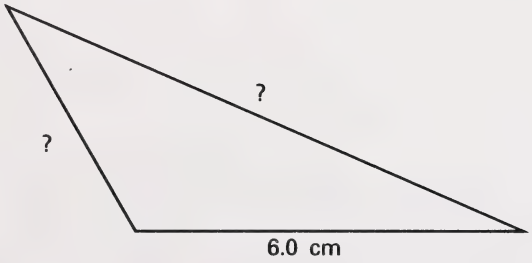
3.



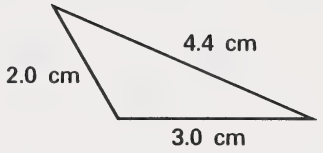
Note: This similar figure is twice as big.

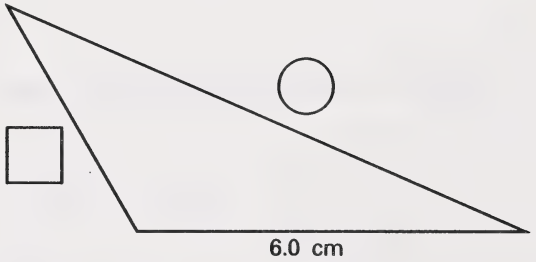
4. These triangles are similar. Calculate the missing lengths. Do not measure.





4.





$$\frac{\square}{6.0} = \frac{2.0}{3.0} \qquad \frac{\bigcirc}{6.0} = \frac{4.4}{3.0}$$

$\times 2$ $\times 2$

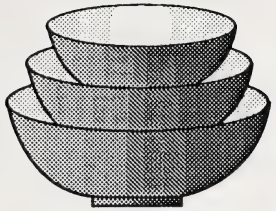
$$\frac{\square}{6.0} = \frac{2.0}{3.0} \qquad \frac{\bigcirc}{6.0} = \frac{4.4}{3.0}$$

$\times 2$ $\times 2$

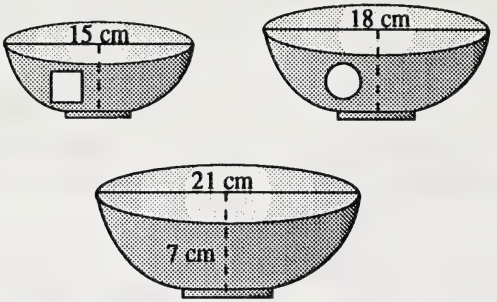
$$\frac{\boxed{4.0}}{6.0} = \frac{2.0}{3.0} \qquad \frac{\textcircled{8.8}}{6.0} = \frac{4.4}{3.0}$$

The missing lengths are 4.0 cm and 8.8 cm.

5. These stacking bowls are similar. Their diameters are 15 cm, 18 cm, and 21 cm. The largest bowl is 7 cm deep. How deep are the others?



5.



$$\frac{15}{\square} = \frac{21}{7} \qquad \frac{18}{\bigcirc} = \frac{21}{7}$$

$$\overset{\times 5}{\frac{15}{\square}} = \frac{3}{1} \qquad \overset{\times 6}{\frac{18}{\bigcirc}} = \frac{3}{1}$$

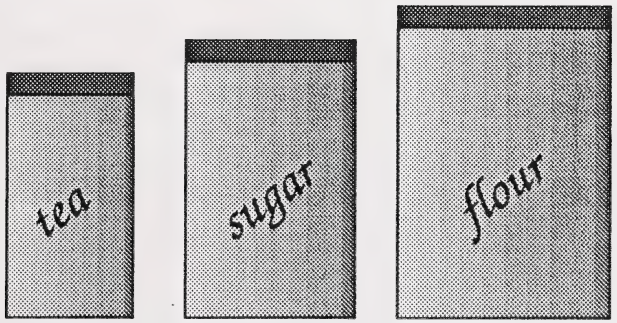
$$\frac{15}{5} = \frac{3}{1} \qquad \frac{18}{6} = \frac{3}{1}$$

The smallest is 5 cm deep and the other is 6 cm deep.

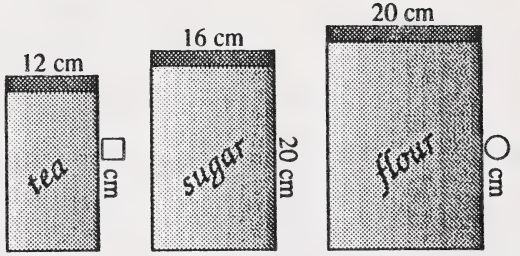
6. These canisters are similar. The sugar canister is 16 cm wide and 20 cm high.

   a. The tea canister is 12 cm wide. How high is it?

   b. The flour canister is 20 cm wide. How high is it?



6.



a. $\frac{12}{\square} = \frac{16}{20}$

$\times 3$

$\frac{12}{\square} = \frac{4}{5}$

$\times 3$

$\frac{12}{15} = \frac{4}{5}$

The tea cannister is 15 cm high.

b. $\frac{20}{\bigcirc} = \frac{16}{5}$

$\times 5$

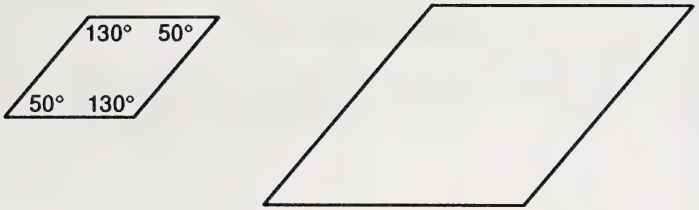
$\frac{20}{\bigcirc} = \frac{4}{5}$

$\times 5$

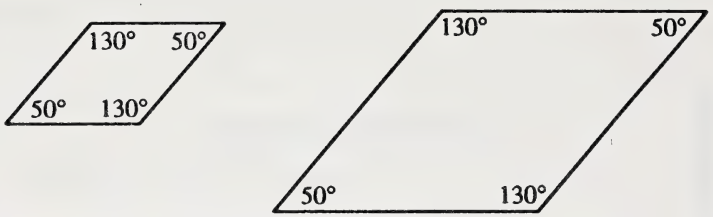
$\frac{20}{25} = \frac{4}{5}$

The flour cannister is 25 cm high.

7. These figures are similar. Give the measure of the angles in the second figure. Do not use a protractor.



7.



The two figures are similar. The corresponding angles have the same measure.

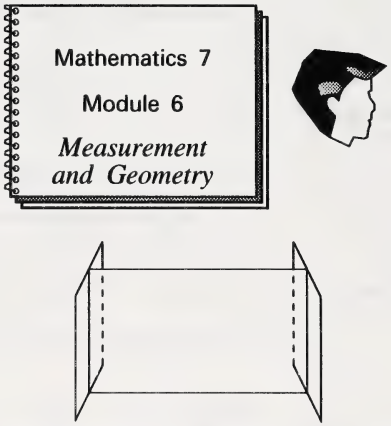
FLIP SYMMETRY

What Lies Ahead

In this section the student will learn to test for flip symmetry, lines of symmetry.

Gathering Materials

These items will be needed.



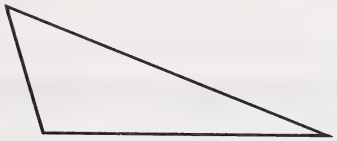
Guiding the Student

- Have the student turn to Section 20 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

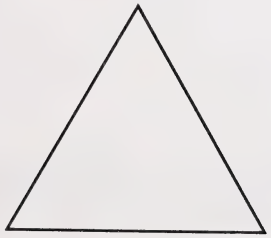
1. Do the following figures have flip symmetry? If so, draw the lines of symmetry. Using the tracing paper provided at the end of this booklet.

a.



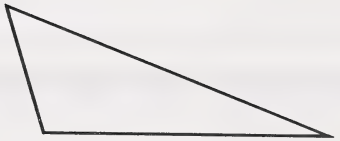
b.

c.



Suggested Answers

1. a.

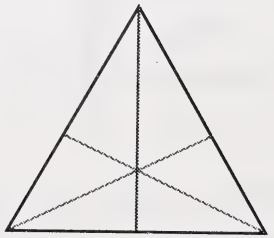


No lines of symmetry

b.

1 line of symmetry

c.



3 lines of symmetry

2. Do the following letters have flip symmetry? Use a MIRA to test for flip symmetry.

a.

b.

c.

d.

2. a. No (no lines of symmetry)

b. Yes (1 line of symmetry)

c. Yes (2 lines of symmetry)

d. No (no lines of symmetry)

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

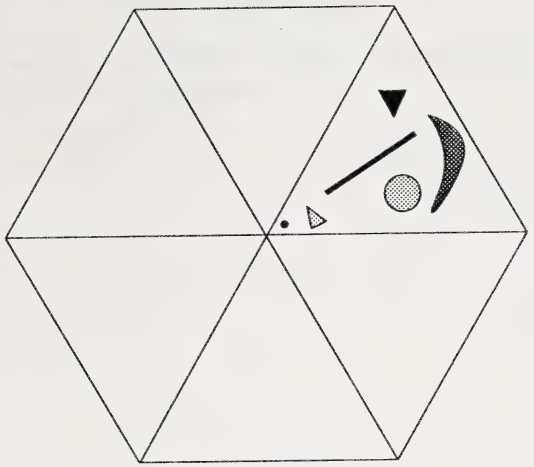
Concluding Activities

1. Make a design of your own using flip symmetry.

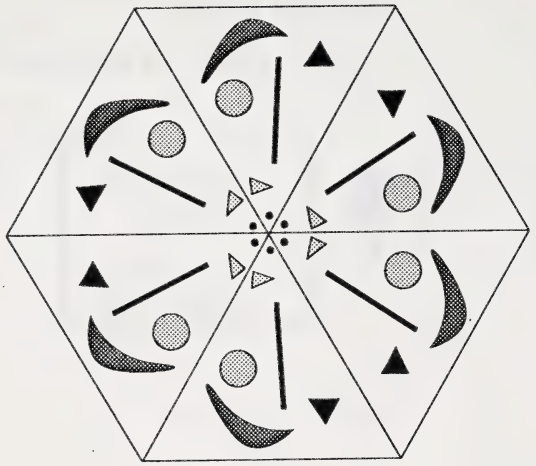
Suggested Answers

1. Answers will vary.

2. Complete this pattern. The lines are lines of symmetry. Use a MIRA to help you.



2.



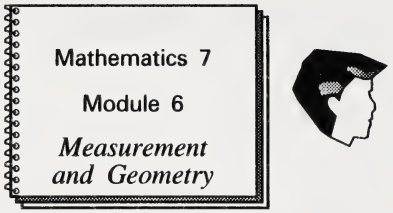
TURN SYMMETRY

What Lies Ahead

In this section the student will learn to test for turn symmetry, points of symmetry.

Gathering Materials

These items will be needed.



A straight pin is needed.

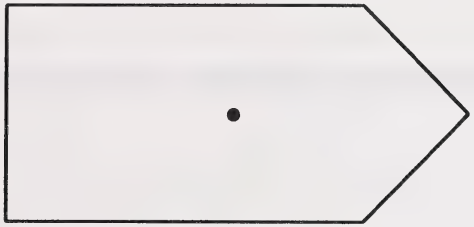
Guiding the Student

- Have the student turn to Section 21 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

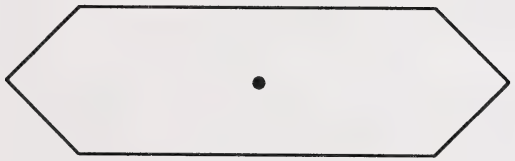
Practice Activities

Do the following figures have turn symmetry? If so, give the order of turn symmetry. Use tracing paper provided at the end of this booklet and a pin to test the figures.

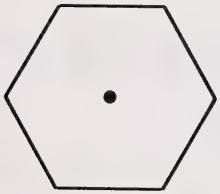
1.



2.



3.



Suggested Answers

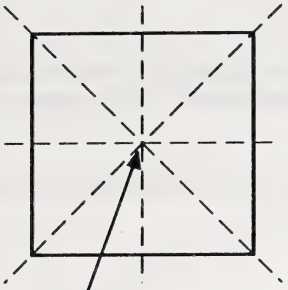
1. No

2. Yes, it has turn symmetry of order 2.

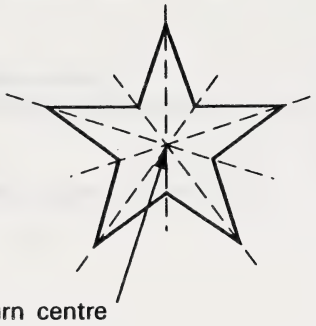
3. Yes, it has turn symmetry of order 6.

4. Turn centres for any polygon of Order 2 or more may be located by finding the point of intersection of the lines of symmetry. Study these examples.

square: Order 4

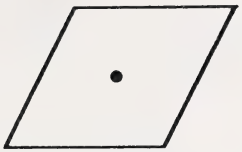


star: Order 5



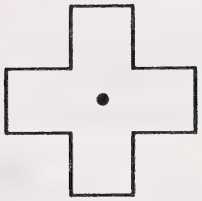
Find the turn centre and the order of turn symmetry for each figure below.

a.



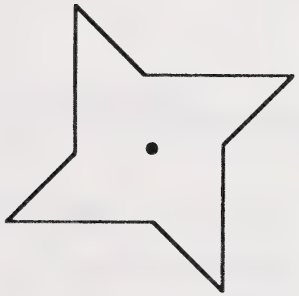
4. a. It has a turn order of 2.

b.



b. It has a turn order of 4.

c.



c. It has a turn order of 2.

5. Which of the capital letters have half-turn symmetry?

5. H, I, N, O, S, X, Z

6. The numeral 1961 has half-turn symmetry. Can you find other numerals with half-turn symmetry?

6. 101, 609, 619, 906, etc.

Guiding the Student

- Have the student do the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

Make a design with turn symmetry. It should have a turn order of 4 or greater.

Suggested Answers

Answers will vary.

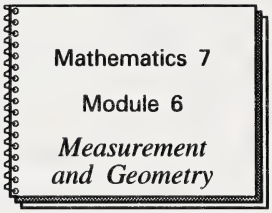
TILING PATTERNS

What Lies Ahead

In this section the student will learn to make tiling designs using dot paper and pattern blocks.

Gathering Materials

These items will be needed.



felts or crayons

For the Concluding Activities the student will need to borrow one or more of the following textbooks.

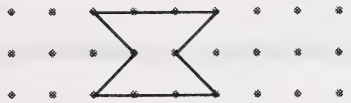
Journeys in Math 7 (Ginn, 1987)
Journeys in Math 8 (Ginn, 1987)
Mathways 8 (Copp, Clark, Pitman, 1980)
Mathematics 7 (Houghton Mifflin, 1985)
Holt Math 7 (Holt, 1984)

Guiding the Student

- Have the student turn to Section 22 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

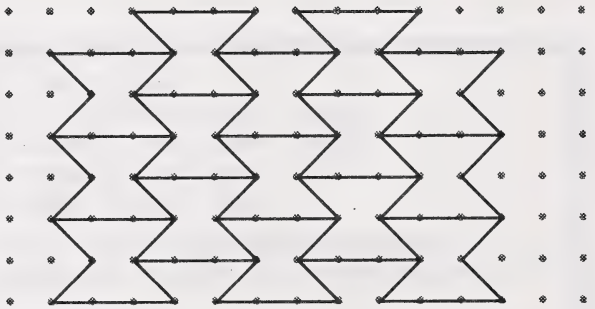
Practice Activities

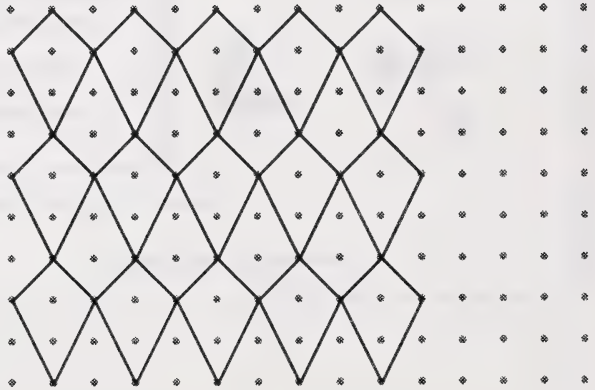
1. Will each of the following figures tesselate? Remember a tesselation is a tiling pattern with only one shape and in the tiling process the region is covered completely without overlap. Support your answers by using the dot paper at the right.

a. 

b.

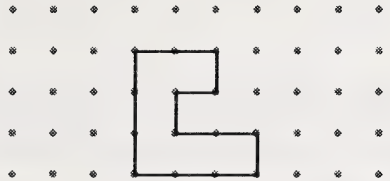
Suggested Answers

1. a. Yes 

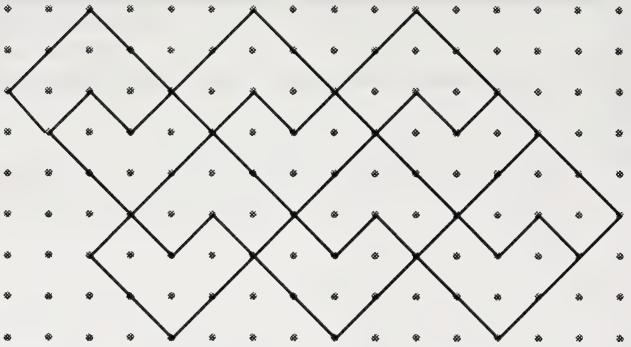
b. Yes 

c.

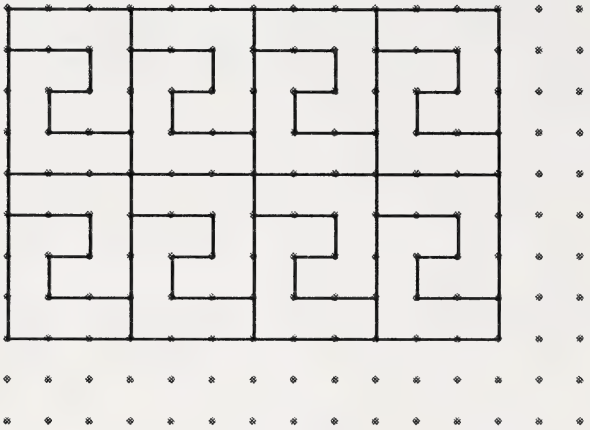
d.



c. Yes



d. Yes



2. Make a tiling pattern of your own with more than one shape. Use pattern blocks, square dot paper, or triangular dot paper provided at the end of the booklet. Tape the design in the space provided on this page.

2. Answers will vary.

Guiding the Student

- Assign the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

Concluding Activities

1. Make a unique tesselation at the right using the method described in "Working Together." You can use the stiff paper provided at the end of this booklet.

2. An artist named M.C. Escher (1898-1972) was famous for his tesselations and tilings. View some of his interesting designs. They can be found in the following books:

   Journeys in Math 7 (Ginn, 1987), page 374

   Journeys in Math 8 (Ginn, 1987), pages 392 and 393

   Mathways 8 (Copp, Clark, Pitman, 1980), pages 110 and 117

   Houghton Mifflin Mathematics 7 (1985), page 139

   Holt Math 7 (1984), page 342

Suggested Answers

1. Answers may vary.

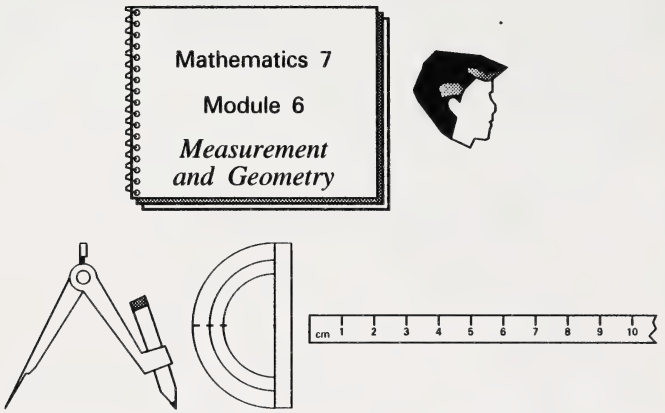
COMPASS DESIGNS

What Lies Ahead

In this section the student will learn to make designs using a compass.

Gathering Materials

These items will be needed.



Guiding the Student

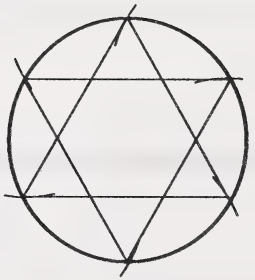
- Have the student turn to Section 23 in the module booklet and read the "What Lies Ahead" box.
- Next have the student read "Working Together" and do the Practice Activities.
- Afterwards, help the student check the answers and correct any errors.

Practice Activities

1. Make a design like the first design in "Working Together." Use the first set of directions.

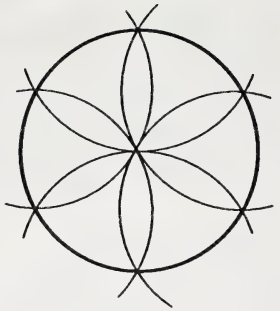
Suggested Answers

1.



2. Make a design like the second design in "Working Together." Use the second set of directions.

2.



3. Make a compass design of your own and colour it.

3. Answers may vary.

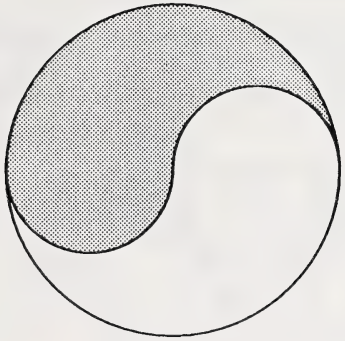
Guiding the Student

- Have the student do the Concluding Activities.
- Afterwards, help the student check the answers and correct any errors.

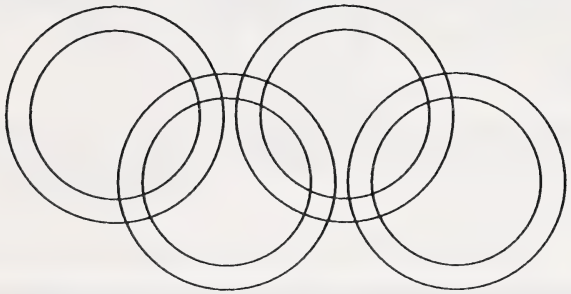
Concluding Activities

Make the following geometric designs using a compass.

1.



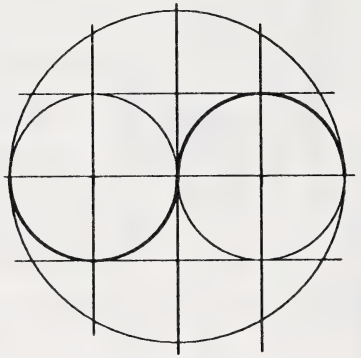
2.



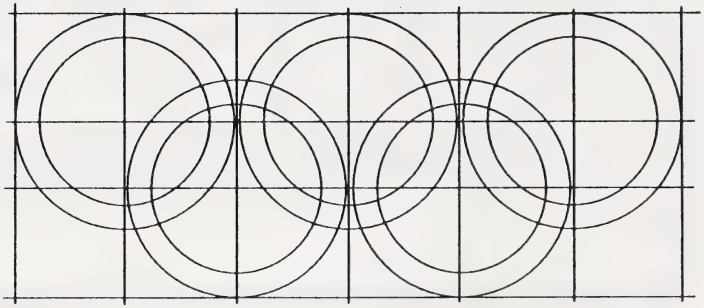
Suggested Answers

For Questions 1 to 3 students will need to erase extra lines. The following show the student all th construction lines required to make the designs. If students are having difficulty, show the student each of these figures and then let the student attempt to copy the design. Note crosses indicate centre of circles.

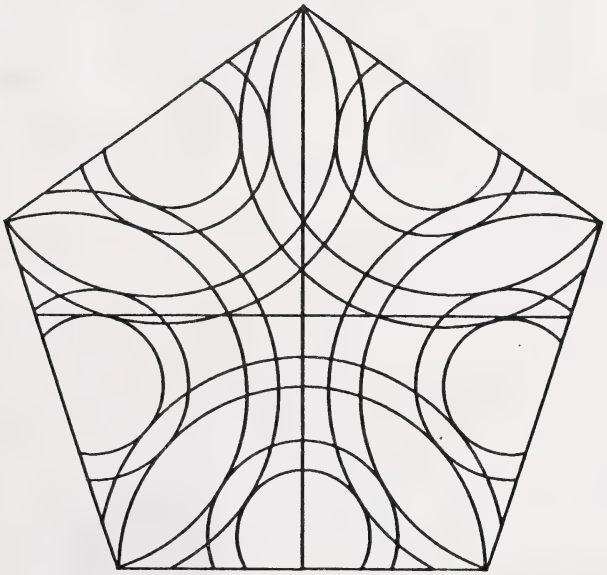
1.



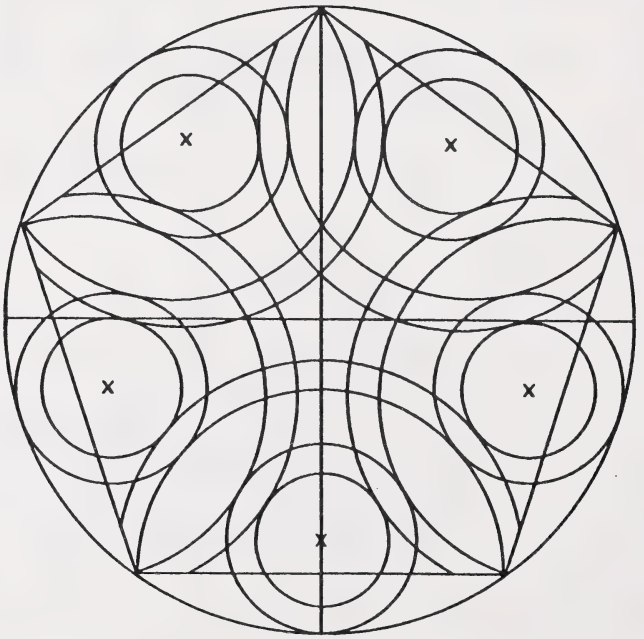
2.



3.



3.



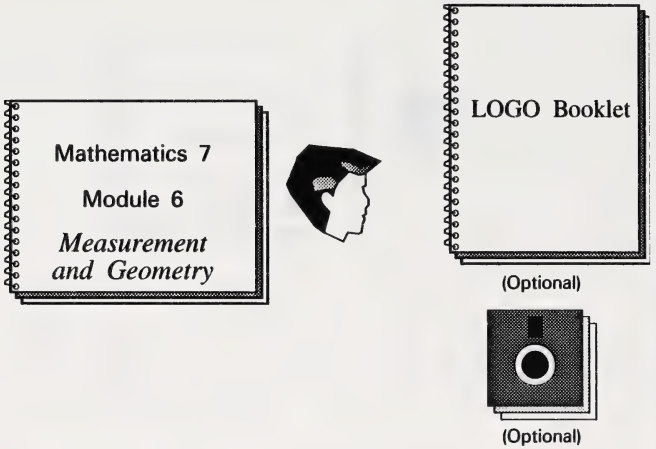
LOGO DESIGNS

What Lies Ahead

In this section the student will learn to make designs using a computer. This section is optional. It is included for students who have access to a computer.

Gathering Materials

The student will need these items for this section.



Guiding the Student

- Have the student turn to Section 24 in the module booklet and read the "What Lies Ahead" box and "Working Together."
- Have the student preview the *LOGO Booklet*.
- If the student wishes to complete the computer activities, he or she should work through the booklet. Answers are in the appendix of the booklet.

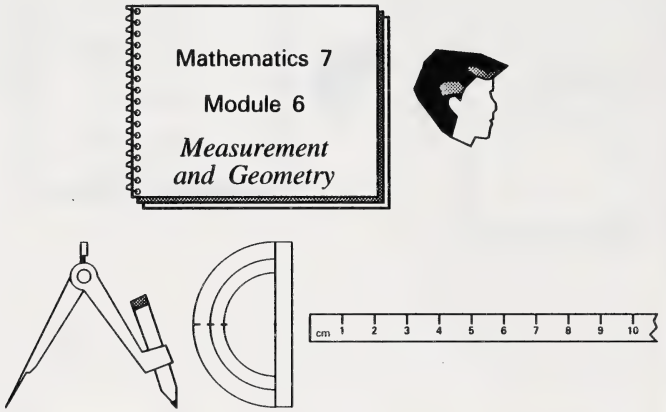
SUMMARY

What Lies Ahead

In the summary the student will review the skills taught in Sections 14-24.

Gathering Materials

The student will need these items for this section.



Guiding the Student

- Have the student turn to the Summary and review the skills taught in Sections 14-24.
- Then have the student turn Section 14 and review the Pretest.
- Afterwards, have the student correct any errors he or she may have made at the time the Pretest was written.

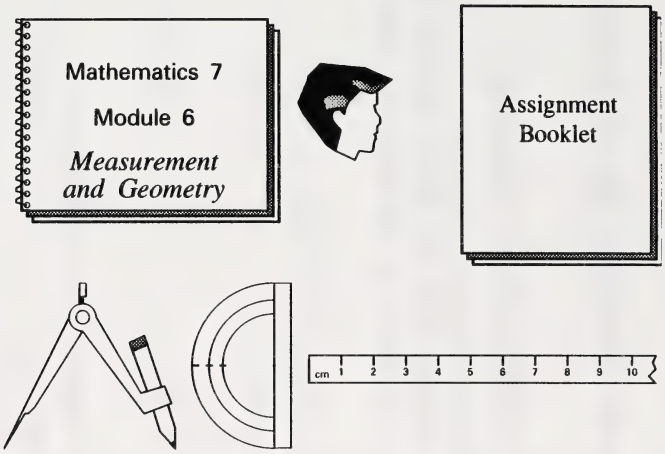
MODULE CONCLUSION

What Lies Ahead

The student is now ready to complete the *Assignment Booklet.*

Gathering Materials

The student will need these items for this section.



Guiding the Student

- Have the student complete the Module Assignment independently. The student may use resource material, but cannot get help. The student should attempt all parts of the assignment.
- Afterwards, provide the student with a grade and feedback.

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Suggested Answers to the Assignment Booklet

Part 1: Multiple Choice Questions

Each of the following questions has four suggested answers, one of which is better than the others. Indicate your choice by putting the letter in the blank on the response page at the right.

2 1. The length of a bridge is

a. 6 km
b. 6 m
c. 6 cm
d. 6 mm

2 2. The capacity of a bathtub is

a. 50 mL
b. 50 L
c. 1000 mL
d. 1000 L

2 3. An average man's mass is

a. 75 g
b. 75 mg
c. 75 t
d. 75 kg

2 4. The length of a pencil is

a. 15 cm
b. 15 mm
c. 15 m
d. 15 km

2 5. 25 cm = ☐ m

a. 0.25
b. 250
c. 0.025
d. 2500

Part 1 Response Page

1. a

2. b

3. d

4. a

5. a

Part 1 (continued)

2 6. 1000 mm = ☐ km

a. 100
b. 10
c. 1
d. 0.1

2 7. 26 mm = ☐ cm

a. 2.6
b. 260
c. 0.26
d. 2600

2 8. 10 cm^3 = ☐ mL

a. 100
b. 1000
c. 10
d. 1

2 9. 2 L = ☐ mL

a. 2000
b. 20
c. 200
d. 2

2 10. 250 g = ☐ kg

a. 25
b. 2.5
c. 0.25
d. 2500

Part 1 Response Page (continued)

6. c

7. a

8. c

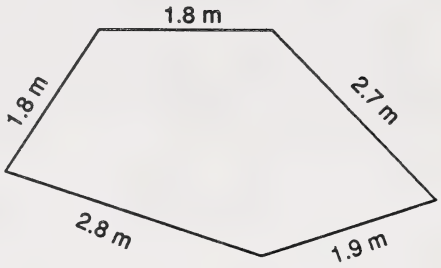
9. a

10. c

Part 1 (continued)

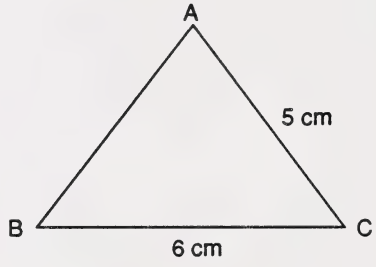
2 11. The perimeter of the polygon is

a. 12.0 m
b. 11.0 m
c. 10.0 m
d. 9.2 m



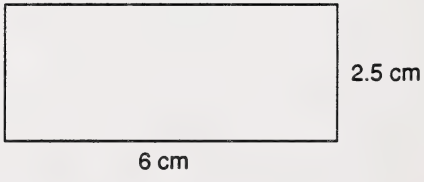
2 12. The perimeter of triangle ABC is 15.5 cm. The length of $\overline{AB}$ is

a. 10.5 cm
b. 9.5 cm
c. 4 cm
d. 4.5 cm



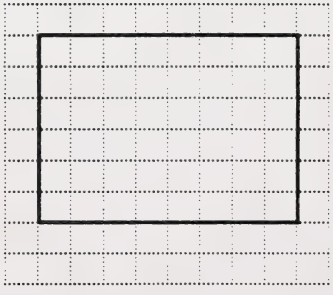
2 13. The length of a rectangle is 6 cm. The width is 2.5 cm. The perimeter of the rectangle is

a. 8.5 cm
b. 16.5 cm
c. 17 cm
d. 18 cm



2 14. The area of the rectangle in square units is

a. 14
b. 28
c. 48
d. 63



Part 1 Response Page (continued)

11. b

12. d

13. d

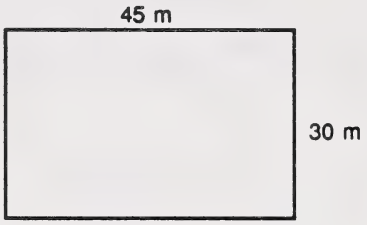
14. b

Part 1 (continued)

2

15. How much fencing is needed to fence a rectangular field 45 m by 30 m?

a. 1350 m
b. 150 m
c. 120 m
d. 75 m

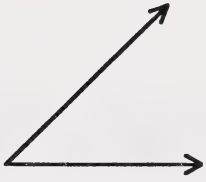


2

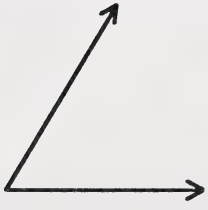
16. Which angle has a measure closest to 60°?

a.

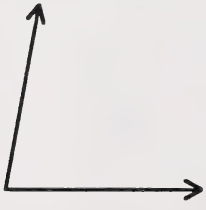
b.



c.



d.



Part 1 Response Page (continued)

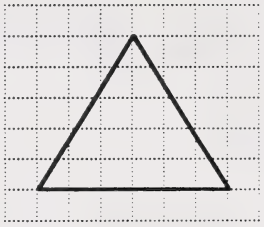
15. b

16. c

Part 1 (continued)

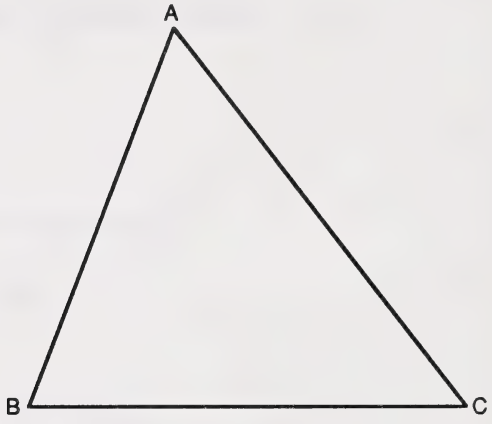
2 17. The area of the triangle in square units is

a. 30
b. 18
c. 20
d. 15



2 18. Another name for $\angle A$ is

a. $\angle ACB$
b. $\angle CBA$
c. $\angle BAC$
d. $\overline{AB}$

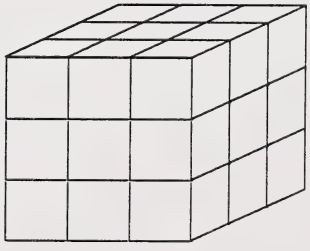


2 19. In Question 18 the measure of $\angle A$ is

a. 60°
b. 120°
c. 50°
d. 70°

2 20. The volume of the cube is

a. 27 cm^3
b. 27 cm^2
c. 27 cm
d. 9 cm^3



Part 1 Response Page (continued)

17. d

18. c

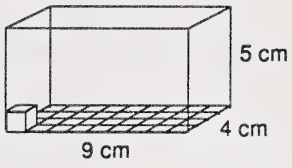
19. a

20. a

Part 1 (continued)

2 21. The volume of the container is

a. 36 cm^2
b. 36 cm^3
c. 180 cm^2
d. 180 cm^3

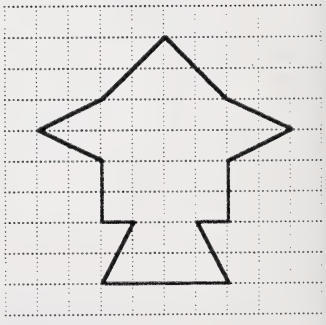


2 22. How many triangles having these three lengths can be drawn?

_____
_____
_____

a. 0
b. 1
c. 2
d. 3

2 23. Which statement best describes this figure?



a. This figure has no flip symmetry, but it has turn symmetry.

b. This figure has flip symmetry and turn symmetry.

c. This figure has flip symmetry, but it has no turn symmetry.

d. This figure has no flip symmetry and no turn symmetry.

Part 1 Response Page (continued)

21. d

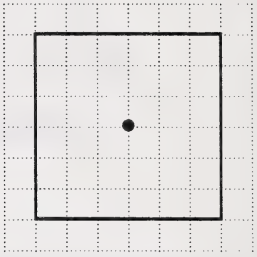
22. b

23. c

Part 1 (continued)

2

24. Which statement best describes the square?



a. This square has 4 lines of symmetry and turn symmetry of order 1.
b. This square has 4 lines of symmetry and turn symmetry of order 4.
c. This square has 2 lines of symmetry and turn symmetry of order 2.
d. This square has 2 lines of symmetry and turn symmetry of order 1.

2

25. Which pair of turns gives the same result?

a. $\frac{1}{2}$ turn cw; $\frac{1}{4}$ turn ccw

b. $\frac{1}{4}$ turn cw; $\frac{1}{4}$ turn ccw

c. $\frac{1}{2}$ turn cw; $\frac{3}{4}$ turn ccw

d. $\frac{1}{4}$ turn cw; $\frac{3}{4}$ turn ccw

Part 1 Response Page (continued)

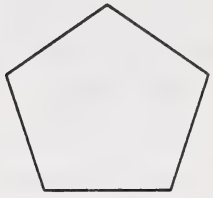
24. b

25. d

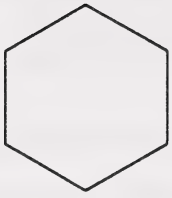
Part 1 (continued)

2 26. Which shape can be used to make a tesselation?

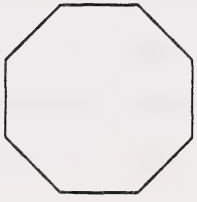
a.



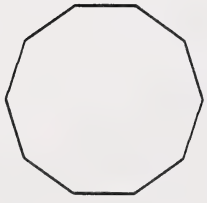
b.



c.



d.



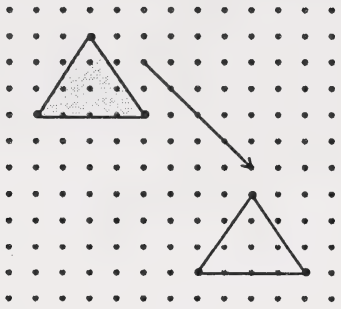
Part 1 Response Page (continued)

26. b

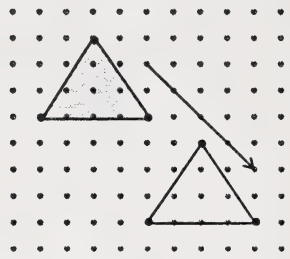
Part 1 (continued)

2 27. Which diagram shows a correctly placed slide image?

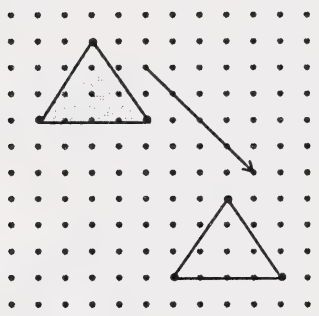
a.



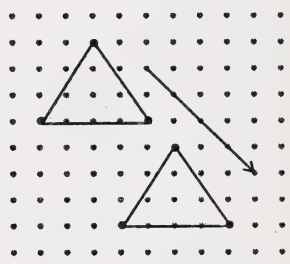
c.



b.

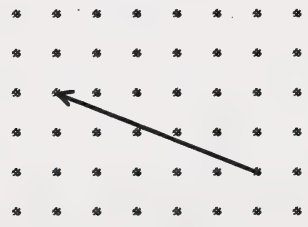


d.

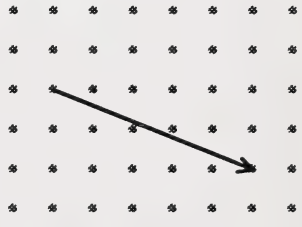


2 28. Which is the slide arrow for the rule (R5, U2)?

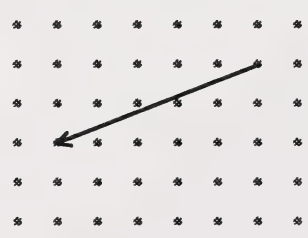
a.



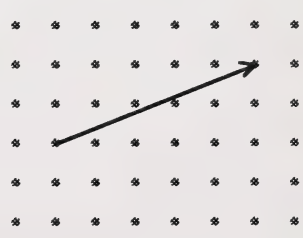
c.



b.



d.



Part 1 Response Page (continued)

27. b

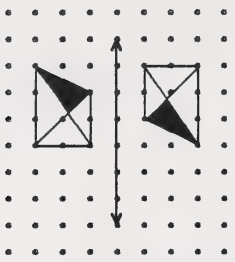
28. d

Part 1 (continued)

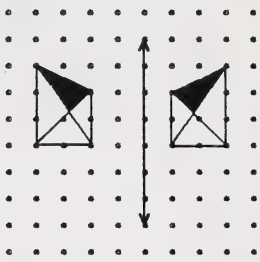
2

29. Which diagram shows a correctly placed flip image?

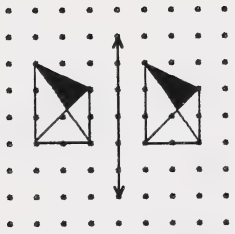
a.



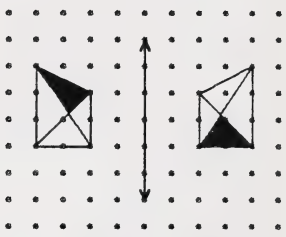
c.



b.



d.



2

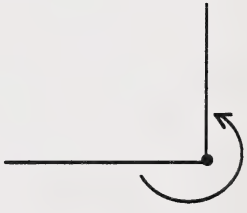
30. Which rotation describes this turn angle?

a. $\frac{3}{4}$ turn ccw

b. $\frac{1}{4}$ turn cw

c. $\frac{3}{4}$ turn cw

d. $\frac{1}{4}$ turn ccw



Part 1 Response Page (continued)

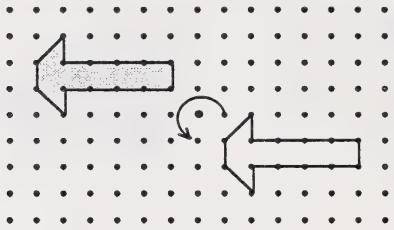
29. b

30. a

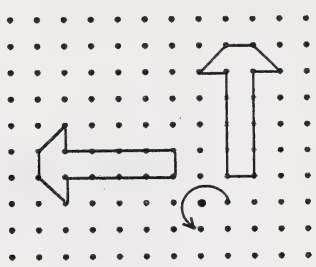
Part 1 (continued)

2 31. Which diagram shows a correctly placed turn image?

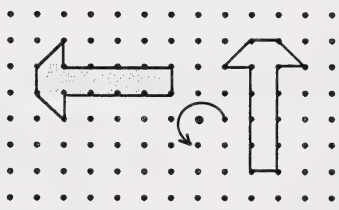
a.



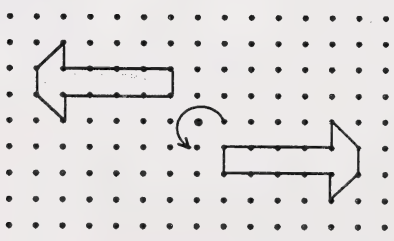
b.



c.



d.



Part 1 Response Page (continued)

31. b

Part 1 (continued)

2 32. Which is the turn angle?

a. $\frac{3}{4}$ turn cw

b. $\frac{1}{2}$ turn cw

c. $\frac{1}{4}$ turn cw

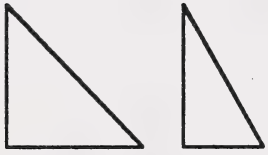
d. $\frac{1}{2}$ turn ccw

2 33. Which pair of triangles is similar?

a.

b.

c.



d.

Part 1 Response Page (continued)

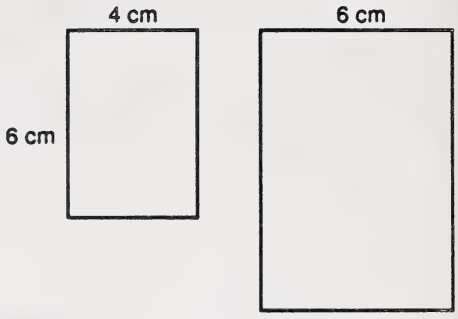
32. ___c___

33. ___a___

Part 1 (continued)

2

34. The two rectangles are similar. What must be the length of the larger rectangle?



a. 7 cm
b. 8 cm
c. 9 cm
d. 10 cm

2

35. Which statement best describes similar figures?

a. Similar figures have corresponding angles congruent and opposite sides congruent.

b. Similar figures have corresponding angles proportional and corresponding sides congruent.

c. Similar figures have corresponding angles proportional, corresponding sides proportional.

d. Similar figures have corresponding angles congruent and corresponding sides proportional.

Part 1 Response Page (continued)

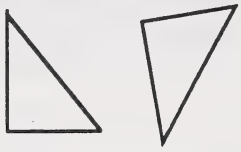
34. c

35. d

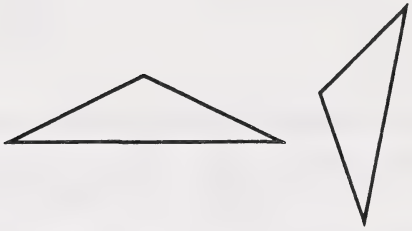
Part 1 (continued)

2 36. Which pair of triangles is congruent?

a.

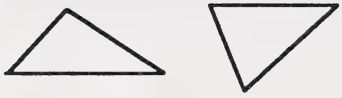


b.



c.

d.

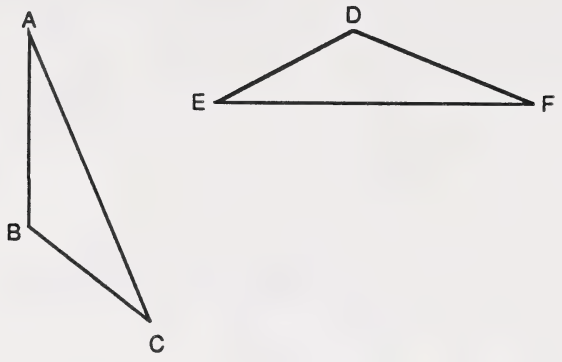


Part 1 Response Page (continued)

36. a

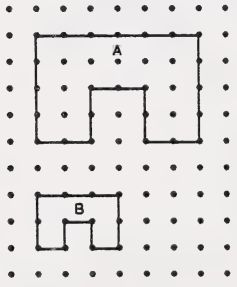
Part 1 (continued)

2 37. The two triangles are congruent. Which statement is **true**?



a. ∠A is congruent to ∠D.
b. ∠A is congruent to ∠E.
c. ∠A is congruent to ∠F.
d. ∠A is congruent to ∠C.

2 38. Which statement best describes figure B?



a. Figure B is congruent to figure A.
b. Figure B is a turn image of figure A.
c. Figure B is similar to figure A.
d. Figure B is a slide image of figure A.

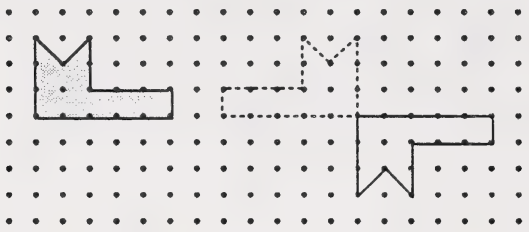
Part 1 Response Page (continued)

37. ___c___

38. ___c___

Part 1 (continued)

2 39. Which motions best describe this image?



a. a flip; $\frac{1}{2}$ turn cw

b. a flip; $\frac{1}{4}$ turn cw

c. a slide; $\frac{1}{2}$ turn cw

d. a slide; $\frac{1}{4}$ turn cw

2 40. How many lines of symmetry does the figure have?

a. 4
b. 2
c. 1
d. 0

Part 1 Response Page (continued)

39. ___a___

40. ___d___

Total for Part 1 = _____ (maximum: 80 marks)

60

Part 2: Short Answers

Give complete answers in the space provided on the response page.

1. Give the more reasonable answer.

2 a. Does an apple have a mass of 150 g or 150 kg?

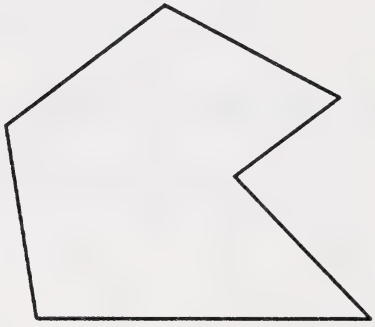
2 b. Does an apple box have a volume of 2400 cm^3 or 2400 m^3?

2 c. Does an ant have a length of 1 cm or 1 mm?

2 d. Does a glass have a capacity of 250 mL or 250 L?

2 e. Does a garden have an area of 600 cm^2 or 600 m^2?

6 2. a. Measure each side of the polygon to the nearest millimetre.



2 b. Find the perimeter of the polygon.

Part 2 Response Page

1. a. 150 g

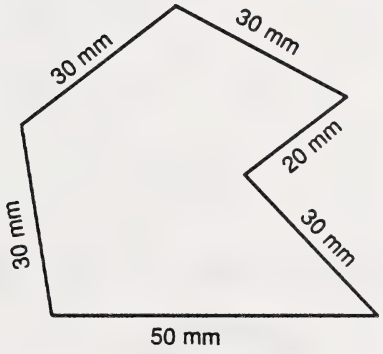
   b. 2400 cm^3

   c. 1 cm

   d. 250 mL

   e. 600 m^2

2. a.



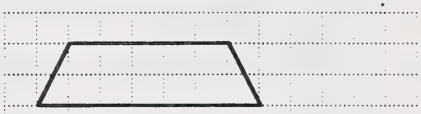
   b. 30 + 30 + 20 + 30 + 50 + 30 = 190

   The perimeter of the figure is 190 mm.

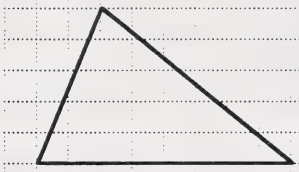
Part 2 (continued)

3. Find the area in square units.

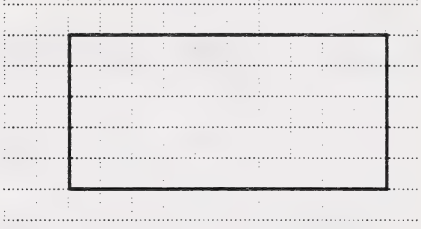
2 a.



2 b.

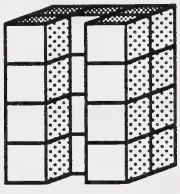


2 c.

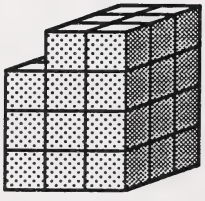


4. Find the volume in cubic units.

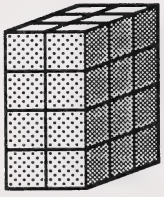
2 a.



2 b.



2 c.



Part 2 Response Page (continued)

3. a. 12 square units

   b. 20 square units

   c. 50 square units

4. a. 20 cubic units

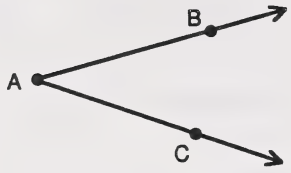
   b. 33 cubic units

   c. 24 cubic units

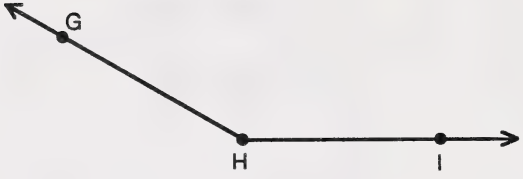
Part 2 (continued)

5. Name the angles. Give the size of the angles.

2 a.



2 b.



6. Use a protractor. Draw the angles.

2 a. 30°

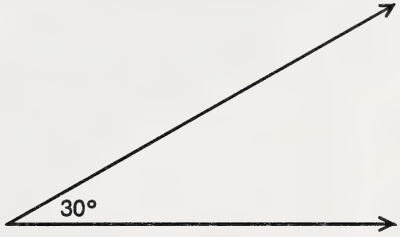
2 b. 120°

Part 2 Response Page (continued)

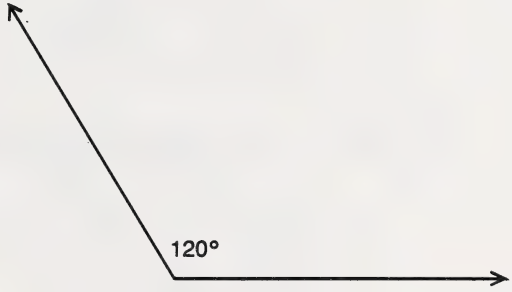
5. a. $\angle BAC = 35°$

   b. $\angle GHI = 150°$

6. a.



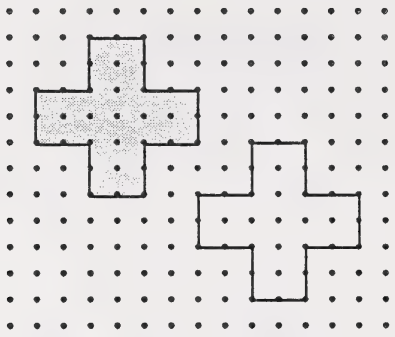
   b.



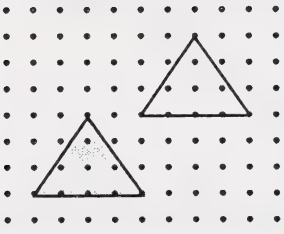
Part 2 (continued)

7. Draw the slide arrow for each of the following slide images.

2 a.

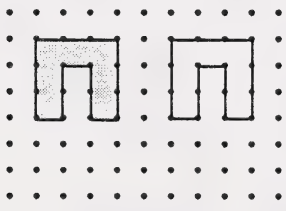


2 b.

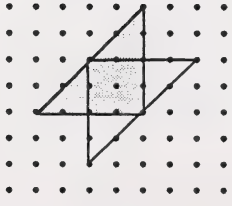


8. Draw the flip lines for each of the following flip images.

2 a.

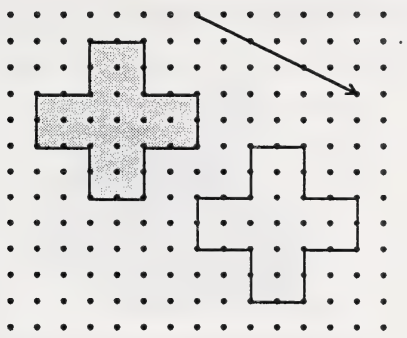


2 b.

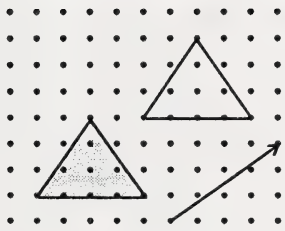


Part 2 Response Page (continued)

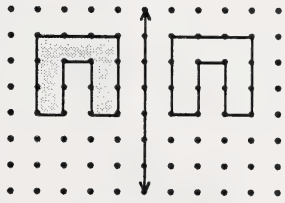
7. a.



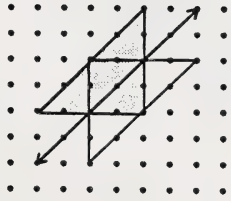
b.



8. a.



b.

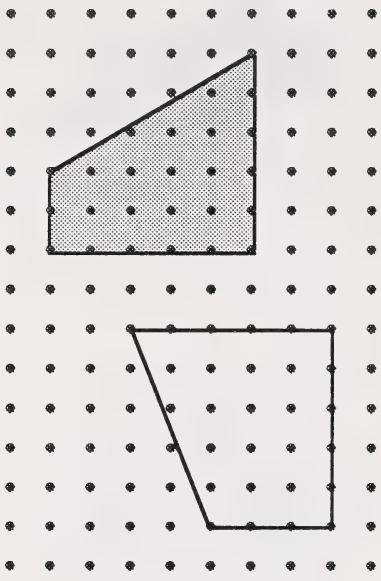


Part 2 (continued)

9. Draw the turn angle for each turn image.

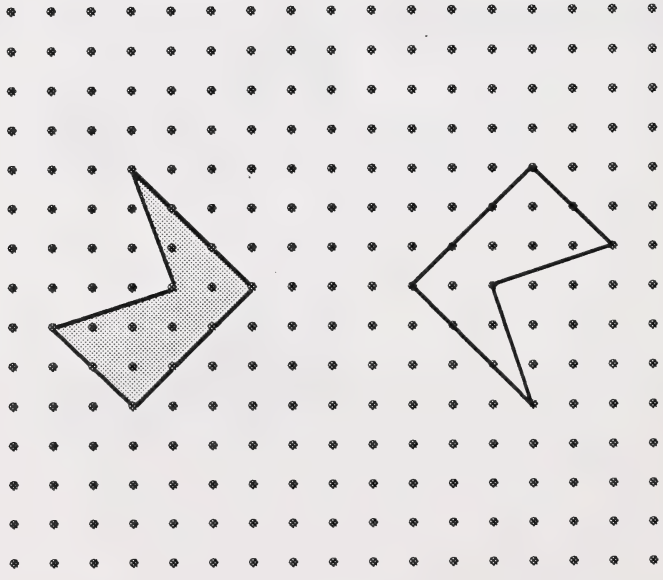
2

a.



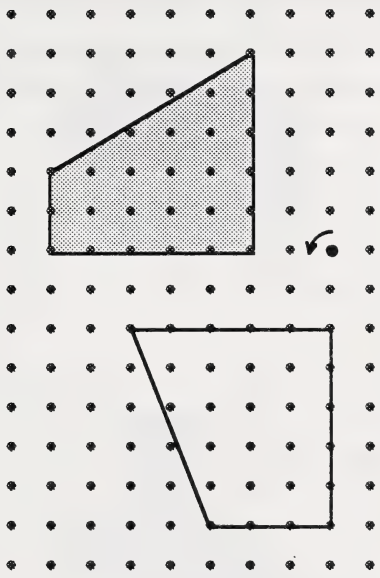
2

b.

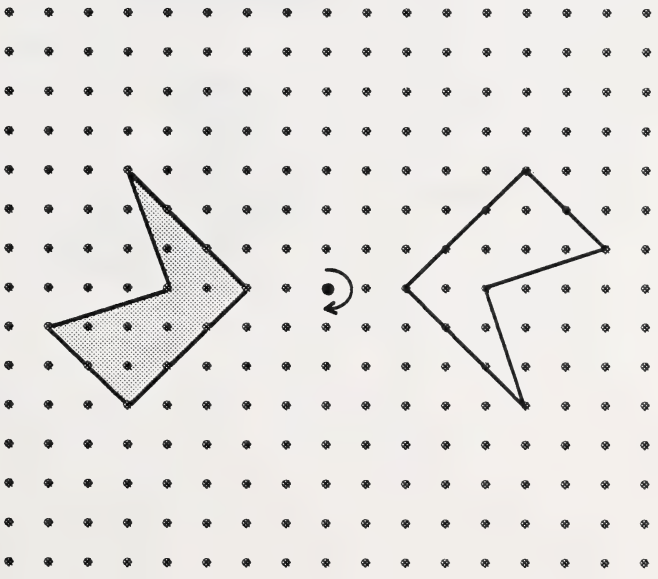


Part 2 Response Page (continued)

9. a.



b.

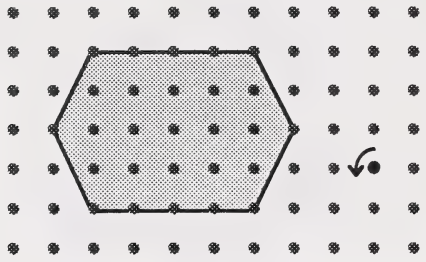


Part 2 (continued)

10. Draw the turn image for each turn angle.

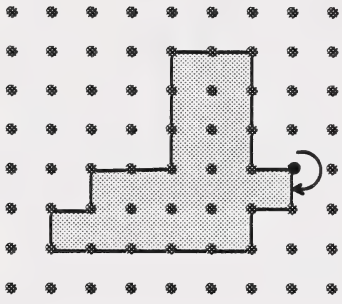
2

a.



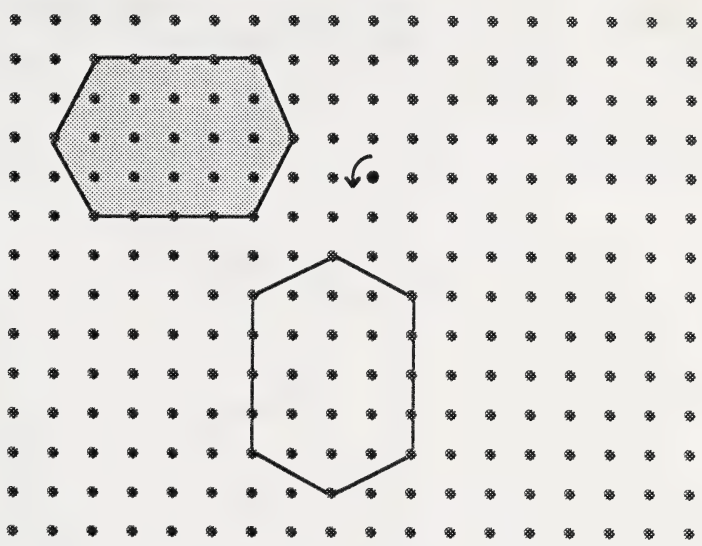
2

b.

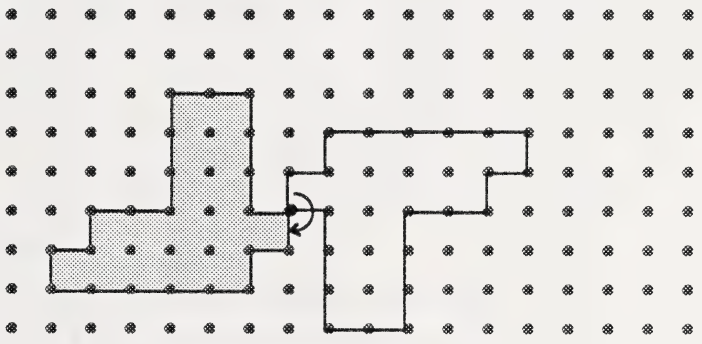


Part 2 Response Page (continued)

10. a.



b.

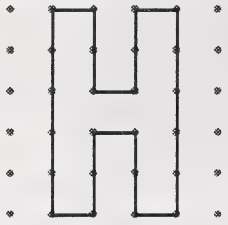


Part 2 (continued)

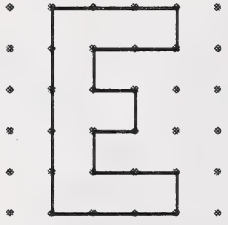
3

11. Will each of the following letters create a tesselation? If yes, show the tesselation.

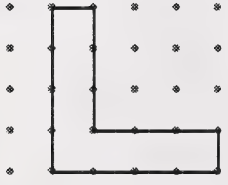
a.



b.



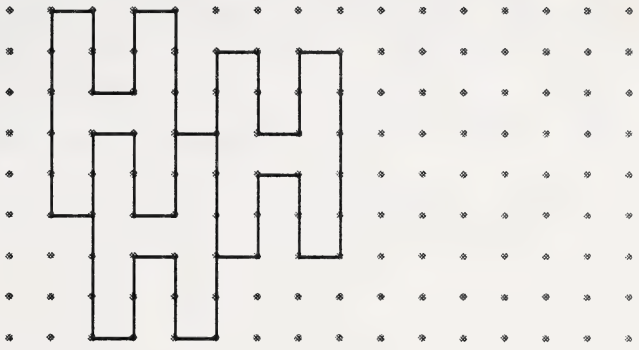
c.



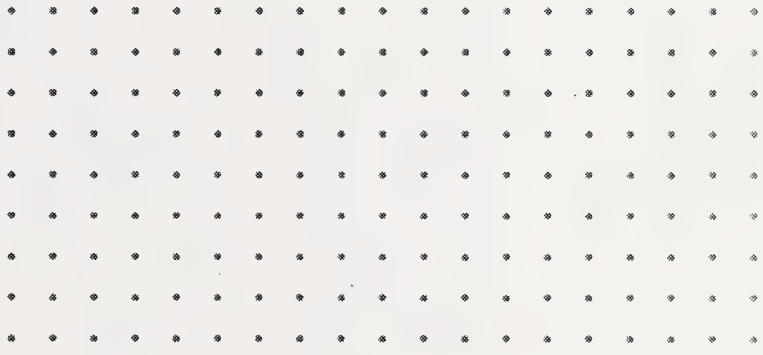
Part 2 Response Page (continued)

11. a. Answers will vary.

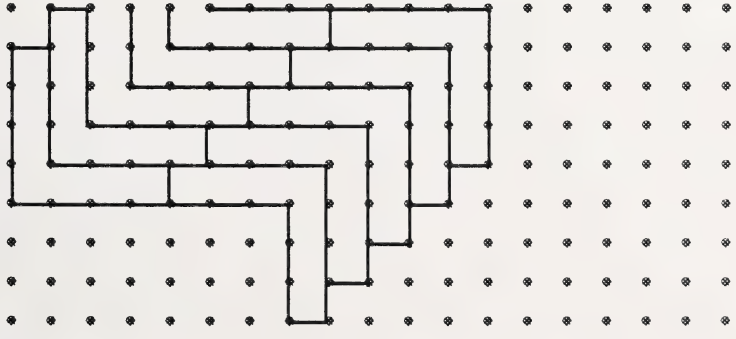
Yes



b. No



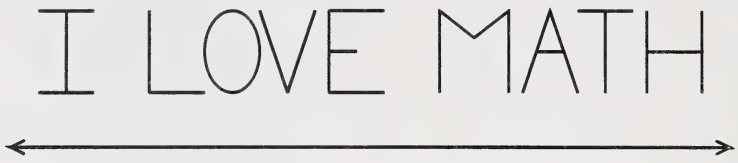
c. Yes



Part 2 (continued)

3

12. Write this message as it would appear in a mirror.



Part 2 Response Page (continued)

12.

Total for Part 2 = _____ (maximum: 60 marks)

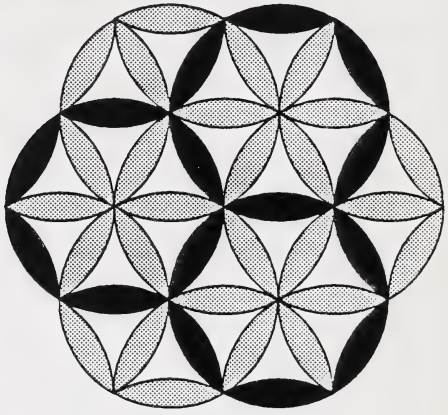
40

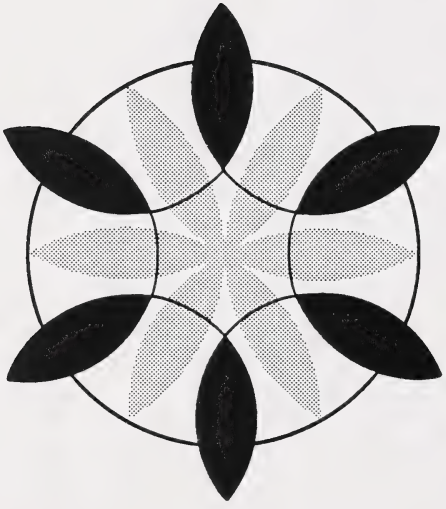
Part 3: Problems

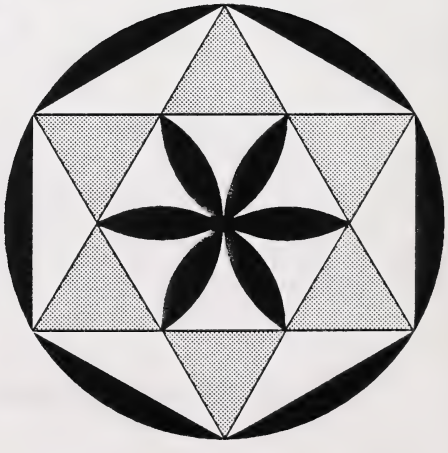
Give complete answers in the space provided on the response page.

4

1. Copy one of these circle designs. You may use a compass, protractor and straightedge.







Part 3 Response Page (continued)

1. Grade the student on his or her ability to figure out how the design was made as well as the completed design.

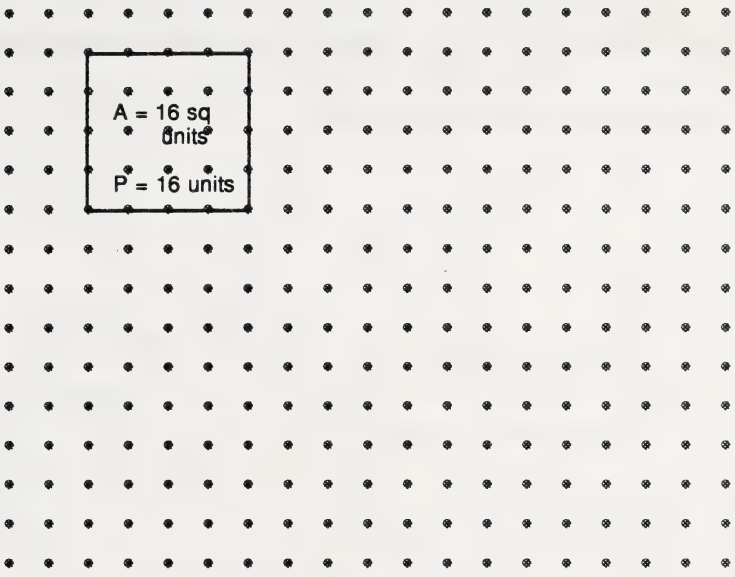
Part 3 (continued)

4 2. a. Draw a square whose area and perimeter is the same number.

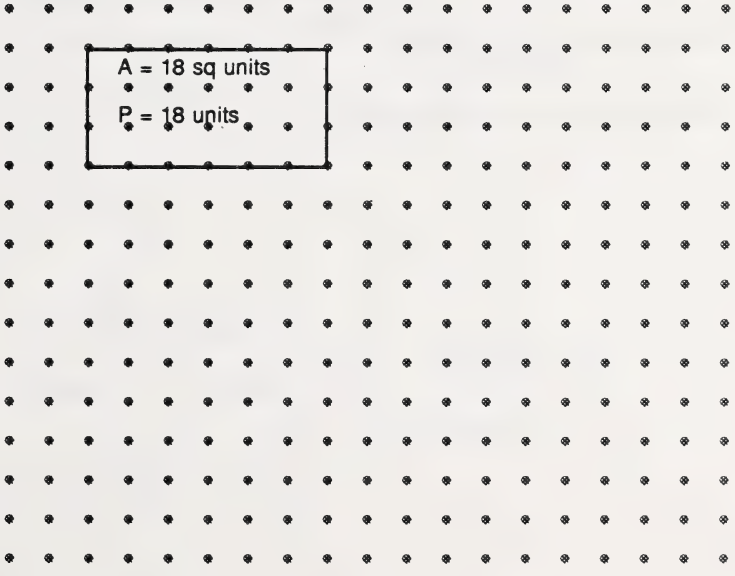
4 b. Draw a rectangle whose area and perimeter is the same number.

Part 3 Response Page

2. a.



b.



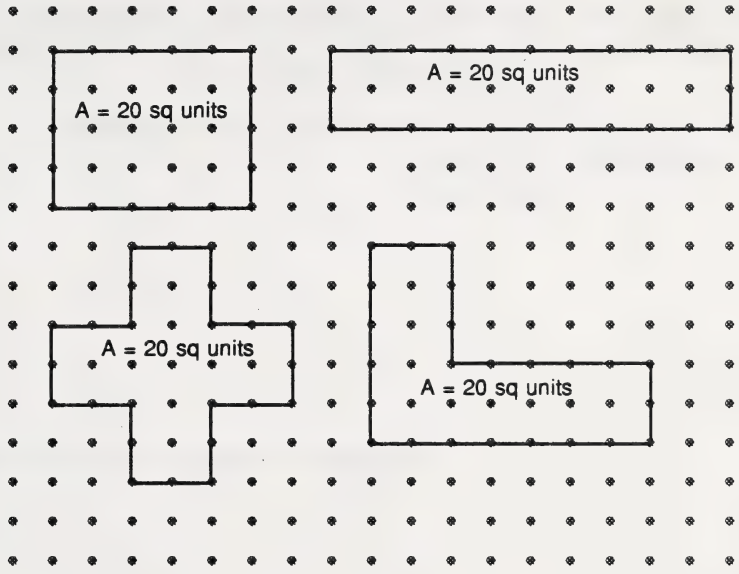
Part 3 (continued)

8 3. a. Draw four figures each having an area of 20 square units.

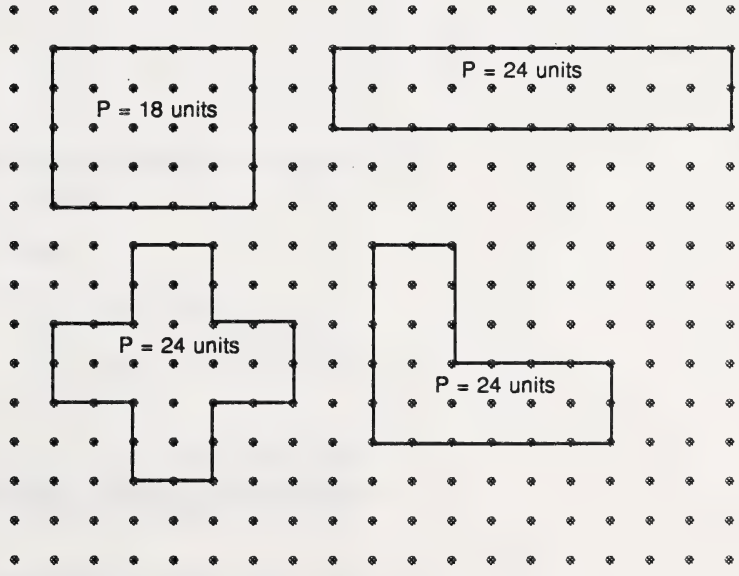
4 b. Find the perimeter of each of the four figures you drew in Part a.

Part 3 Response Page

3. a



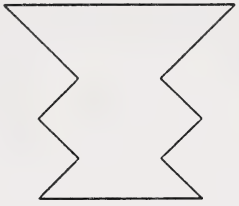
b.



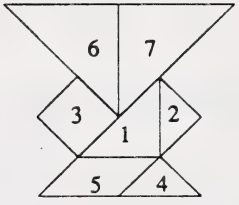
Part 3 (continued)

4. At the end of the booklet there is a 10-cm square. This is called a tangram. The pieces of the tangram can be arranged to create many shapes.

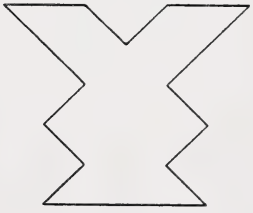
Example: Form this shape.



Solution: Here is a sketch of how to place all the pieces.



4 a. Cut out the tangram pieces and form this shape.

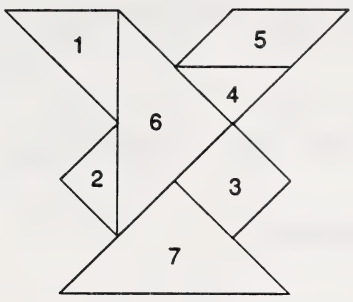


Then draw a sketch to show how you placed all 7 pieces.

4 b. What is the area of the shape you formed?

Part 3 Response Page (continued)

4. a.



Because 2 and 4 are the same size they can be exchanged.

Because 6 and 7 are the same size they can be exchanged.

b. 100 cm^2

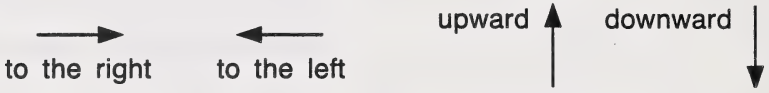
Note

The 10-cm square can be divided into 10 rows of 10 1-cm^2 squares so the area is 100 cm^2.

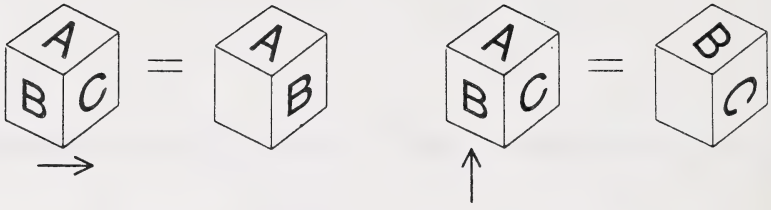
The 10-cm square and the shape have the same area as all the pieces are used.

Part 3 (continued)

5. Each arrow indicates that the block has been rotated a quarter turn, or 90°, in the direction of the arrow.



Examples



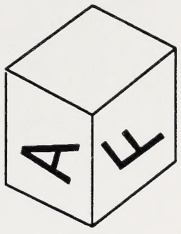
Draw a sketch to show how these blocks will look after the indicated turns. (The faces not showing are blank.)

4 a.

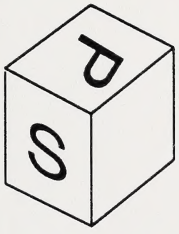
4 b.

Part 3 Response Page (continued)

5. a.



b.



Note

Student may try using sugar cubes to check the turns.

Total for Part 3 = _____ (maximum: 40 marks)

N.L.C. - B.N.C.
3 3286 10835893 4

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Mathematics 7

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